

Empirical Paper

Developing Scratch-Based MEINSIPA to Enhance Cognitive, Affective, and Psychomotor Learning Outcomes in Pancasila Education

Dhena Rismaya^{1*}, Gunawan Setiadi¹, Irfai Fathurohman^{1*}

Affiliations

¹Primary Education, Faculty of Teacher Training and Education, Muria Kudus University, Indonesia

DOI

[10.65820/ejes-19vol2-issue2-2026](https://doi.org/10.65820/ejes-19vol2-issue2-2026)

Abstract

Purpose: This study developed a Scratch-based MEINSIPA (Pancasila Principles Interactive Media) learning medium and evaluated its feasibility and effectiveness in improving the cognitive, affective, and psychomotor learning outcomes of sixth-grade students in Pancasila Education.

Methodology: The study adopted the Borg and Gall Research and Development model, adapted by Sugiyono into seven stages, including needs analysis, product design, validation, revision, and trial. Data were collected through achievement tests, observations, and questionnaires and analysed using descriptive and inferential statistics.

Results: The MEINSIPA learning medium was rated highly feasible by media (90%), material (98%), and language (100%) experts. It also received positive evaluations from students (95.85%) and teachers (94%). The experimental group recorded a higher N-Gain (0.33, medium) than the control group (0.27, low). Affective learning outcomes reached 81.55% (good), while psychomotor outcomes reached 70.53% (fairly good).

Novelty and Contributions: The study demonstrates that integrating Scratch with character-based civic education provides an effective interactive learning medium for elementary Pancasila Education, promoting computational thinking alongside civic values.

Social and Practical Implications: MEINSIPA offers teachers an engaging, student-centred digital instructional tool that enhances academic achievement, character development, and practical skills while supporting the broader integration of educational technology in elementary classrooms.

Keywords: Scratch; Pancasila Education; Interactive Learning Media; Elementary Education; Learning Outcomes

*Corresponding author

E-mail address: irfai.fathurohman@umk.ac.id

How to cite this article:

Rismaya, D., Setiadi, G., & Fathurohman, I. (2026). Developing Scratch-Based MEINSIPA to Enhance Cognitive, Affective, and Psychomotor Learning Outcomes in Pancasila Education. *Elicit Journal of Education Studies*, 2(2), 233-251. <https://doi.org/10.65820/ejes-19vol2-issue2-2026>

1 Introduction

Character education is a foundational component of national development, shaping a generation that is intellectually capable and possesses strong moral, ethical, and civic values. In Indonesia, this mandate is operationalised through Pancasila Education, introduced from the early years of elementary school, which cultivates religiosity, humanity, national unity, democratic participation, and social justice rooted in the five principles of Pancasila, and which underlies the Pancasila Student Profile promoted under the Merdeka (Independent) Curriculum (Ministry of Education, Culture, Research, and Technology [Kemendikbudristek], Pendidikan & Kebudayaan, 2022).

Globally, education systems are undergoing rapid digital transformation. Following the disruptions of the COVID-19 pandemic, technology-enhanced and blended pedagogies have become a structural rather than peripheral feature of basic education, with growing evidence that interactive, learner-centred digital tools can support both cognitive mastery and socio-emotional development when they are purposefully designed rather than merely digitised versions of print material. Within civic and character education specifically, recent international scholarship continues to document persistent gaps between curricular intentions for values-based learning and their classroom enactment, calling for more experiential and technology-mediated approaches to civic identity formation. In Indonesia, this challenge is amplified by the scale and diversity of the implementation context: the Merdeka Curriculum became mandatory nationally only recently, and studies evaluating the Pancasila Student Profile Strengthening Project (Projek Penguatan Profil Pelajar Pancasila, P5) across varied school settings continue to report substantial variation in implementation quality, teacher readiness, and the availability of contextually appropriate instructional media (Nisa, 2024).

At the classroom level, the implementation of Pancasila Education in Indonesian elementary schools continues to face practical obstacles. Instruction is frequently dominated by lecture-based delivery and rote memorisation, which constrains student engagement. Abstract civic and ethical concepts are often poorly connected to learners' concrete, everyday experiences, contributing to low participation, limited internalisation of values, and suboptimal achievement across the cognitive, affective, and psychomotor domains of learning targeted by the subject.

Furthermore, the technological environment of today's elementary school students has changed substantially. Children growing up in the 2020s are habituated to gadgets, mobile applications, and visually rich, interactive interfaces, making the integration of technology into classroom instruction less an optional enhancement than a contextual necessity. A growing body of educational-technology research indicates that well-designed digital learning media can increase engagement, motivation, and conceptual understanding across subject areas, provided that design choices are grounded in established learning theory rather than novelty alone.

Among the platforms with demonstrated potential for constructing interactive educational media is Scratch, a block-based visual programming environment developed by the Lifelong Kindergarten Group at the MIT Media Lab (Resnick et al., 2009). Scratch allows users, including elementary school children, to build animations, educational games, and interactive simulations through a drag-and-drop interface that removes the syntactic barriers of conventional text-based programming. Because Scratch couples low technical entry barriers with rich multimedia capability (graphics, sound, branching logic, and scoring systems), it has been used productively well beyond computer-science instruction, including in mathematics, science, and language learning in Indonesian elementary schools (Fang et al., 2023; Maola & Irianto, 2023; Udayani et al., 2024). A systematic review of the use of Scratch and App Inventor in education likewise reports consistent gains in learner motivation, computational thinking, and engagement when block-based tools are embedded in structured pedagogical designs (Pérez-Jorge & Martínez-Murciano, 2022).

Building on this potential, the present study develops MEINSIPA (Media Interaktif Prinsip-Prinsip Pancasila / Pancasila Principles Interactive Media), a Scratch-based learning medium for sixth-grade Pancasila Education. MEINSIPA integrates text, imagery, animation, audio narration, and interactive quizzes tailored to the developmental characteristics of upper-grade elementary students to help learners understand Pancasila values in a more concrete, contextual, and applicable manner while sustaining active engagement. This study extends an earlier development effort by the same research team, which initially conceptualised and piloted MEINSIPA as a Scratch-based game for Pancasila values instruction (Rismaya et al., 2024); the present study advances that work into a full Research and Development cycle with formal expert validation, classroom trial, and assessment of cognitive, affective, and psychomotor outcomes.

Preliminary interviews with sixth-grade teachers at SDN Jembatan 01 indicated that students tend to be passive during Pancasila Education lessons, show limited confidence in voicing opinions, and lose focus easily. Existing digital media use was limited to videos and static slide presentations; interactive, Scratch-based media had never been implemented. Teachers expressed a clear need for innovative learning media that are easy to use, engaging, and capable of increasing student interest and active participation.

Several prior studies have examined Scratch-based learning media and reported favourable outcomes. Scratch-assisted instruction has been shown to support students in solving problems, designing projects, and expressing ideas through programming activity, with benefits extending beyond technical product creation to the development of computational thinking from an early age (Fang et al., 2023). Its intuitive, colour-coded visual interface and flexible multimedia resources make it a practical medium for teaching programming concepts to children, particularly at the elementary level (Udayani et al., 2024), and game-based Scratch media has been found to increase student feedback quality and learning enthusiasm in technical subjects (Nurhalizah & Jayanti, 2023). Within values and citizenship education specifically, Comparable Indonesian studies have validated Scratch- and animation-based media for Pancasila and civic-education content, reporting high expert-validation scores and positive student responses (Nuraini et al., 2023).

However, the majority of existing Scratch-based media research concentrates on exact sciences, numeracy, or introductory programming skills; development efforts that target Pancasila Education specifically, and that evaluate impact comprehensively across the cognitive, affective, and psychomotor domains rather than cognitive achievement alone, remain limited. Studies that systematically analyse teacher and student needs alongside structured user-response evaluation of the resulting medium are similarly scarce.

This gap motivates the present study. Specifically, this research develops Scratch-based MEINSIPA media and examines (a) its feasibility, as judged by media, material, and language experts and by teacher and student response, and (b) its effectiveness in improving sixth-grade students' cognitive, affective, and psychomotor learning outcomes in Pancasila Education, relative to conventional instruction. The study contributes to scholarship in educational technology and character education by demonstrating how a freely available, child-friendly programming platform can be adapted as a structured instructional medium for values-based civic education. It also provides an empirically validated R&D model that other researchers and practitioners can adapt to similar subject areas.

2 Literature Review

Scratch as an Educational Programming Environment

Scratch is a block-based visual programming language developed by the Lifelong Kindergarten Group at the MIT Media Lab, designed to let users, particularly children, create animations, games, and other interactive media without writing syntactically complex code (Resnick et al., 2009). Scratch is free to use, available in both online and offline modes, and includes built-in image and sound editors, which together lower the technical barrier to producing multimedia learning content. Because programming blocks are organised by colour and function, Scratch is considered intuitive and engaging for young learners, and has been applied to teach abstract concepts ranging from mathematics and natural science to civic values across elementary and secondary contexts (Fang et al., 2023; Maola & Irianto, 2023; Pérez-Jorge & Martínez-Murciano, 2022; Udayani et al., 2024).

MEINSIPA: Pancasila Principles Interactive Media

MEINSIPA (Media Interaktif Prinsip-Prinsip Pancasila) is a Scratch-based digital learning tool designed to help elementary school students understand the values of Pancasila in an engaging, interactive way. It integrates text, images, audio narration, animation, and game-based quizzes, enabling two-way interaction that supports both comprehension and sustained engagement. The medium builds on an earlier prototype developed and piloted by the same research team (Rismaya et al., 2024) and is intended to support cognitive Understanding of Pancasila content while simultaneously reinforcing character values in a contextual, applied manner.

Interactive Learning Media in Elementary Education

Interactive learning media refer to instructional tools that allow two-way engagement between the learner and the content, as distinct from passive media such as printed text or non-interactive video. Within Indonesian elementary education, interactive media, including animation-based tools, educational games, and Scratch-assisted simulations, have been associated with improved validity, practicality, and learning effectiveness across multiple subject areas (Maola & Irianto, 2023; Nuraini et al., 2023). Such media are particularly relevant for civic and character education, where abstract values benefit from concrete, scenario-based representation that students can actively manipulate rather than passively receive.

Pancasila Education and the Pancasila Student Profile

Pancasila Education is a compulsory subject in Indonesian basic education that cultivates understanding of, and commitment to, the five principles of Pancasila as the philosophical foundation of the nation. Under the Merdeka Curriculum, Pancasila Education is aligned with the Pancasila Student Profile, which specifies six key dimensions: faith and noble character, global diversity, cooperation (gotong royong), independence, critical reasoning, and creativity, that schools are expected to cultivate across subjects (Pendidikan & Kebudayaan, 2022). Recent studies evaluating the implementation of the Pancasila Student Profile report that while the framework is well-specified at the policy level, classroom enactment varies considerably depending on teacher readiness, instructional resources, and school context (Nisa, 2024), reinforcing the need for concrete, classroom-ready instructional media such as MEINSIPA.

Cognitive Learning Outcomes

The cognitive domain concerns students' thinking abilities, encompassing remembering, understanding, applying, analysing, evaluating, and creating. In the context of Pancasila Education, cognitive outcomes are typically assessed through achievement tests measuring mastery of conceptual material such as the meaning and application of each Pancasila principle (Magdalena et al., 2021).

Affective Learning Outcomes

The affective domain concerns students' attitudes, values, and dispositions, including responsibility, cooperation, tolerance, and discipline. Within the Merdeka Curriculum, affective assessment in Pancasila Education is explicitly aligned with the dimensions of the Pancasila Student Profile (Pendidikan & Kebudayaan, 2022), making attitudinal measurement an integral, rather than supplementary, component of subject evaluation.

Psychomotor Learning Outcomes

The psychomotor domain concerns students' applied skills in carrying out learning tasks, typically assessed through direct observation of process and product. In Pancasila Education, psychomotor assessment commonly takes the form of applied tasks, such as producing a poster or campaign material expressing a Pancasila value, evaluated against indicators of content accuracy, clarity of expression, and presentation quality (Magdalena et al., 2021).

Multimedia Learning Theory

Mayer's Cognitive Theory of Multimedia Learning holds that people learn more effectively from combined words and pictures than from words alone, provided that multimedia material is designed to manage the limited capacity of working memory across separate visual and auditory processing channels (Mayer, 2021). Principles such as coherence (excluding extraneous material), signalling (cueing essential content), and modality (pairing narration with imagery rather than on-screen text with imagery) directly inform the design of Scratch-based media such as MEINSIPA, which combines narrated explanation, illustrative animation, and interactive quizzes rather than text-dense slides.

Constructivist Learning Theory

Constructivist theory, drawing on the work of Piaget (1970) and Vygotsky (1978), holds that learners actively construct understanding through experience, exploration, and social interaction rather than passively absorbing transmitted information. Vygotsky's concept of the zone of proximal development further emphasises the role of scaffolded, interactive tools in extending what learners can accomplish beyond unassisted performance. Interactive, game-based media such as MEINSIPA operationalise constructivist principles by allowing students to explore Pancasila content at their own pace, receive immediate feedback through quizzes, and construct meaning through active manipulation of the learning environment rather than rote reception.

3 Method

Research Design

This study employed a Research and Development (R&D) design to develop and evaluate the feasibility and effectiveness of Scratch-based MEINSIPA media for the Pancasila Education topic 'Practising Pancasila as the Nation's Philosophy of Life' among sixth-grade elementary school students. The development model follows Borg and Gall's R&D framework as adapted by Sugiyono, which in its complete form comprises ten stages. Consistent with common practice in classroom-based educational R&D under time and resource constraints, the present study implemented a simplified seven-stage sequence: (1) potential and problem analysis, (2) data collection, (3) product design, (4) design validation, (5) product revision, (6) product trial, and (7) final revision. This simplification combined the original model's preliminary field-testing and main product-revision stages and omitted large-scale operational field testing and dissemination, which were beyond the scope and resources of the present study; the core logic of need analysis, iterative expert validation, and empirical trial was preserved.

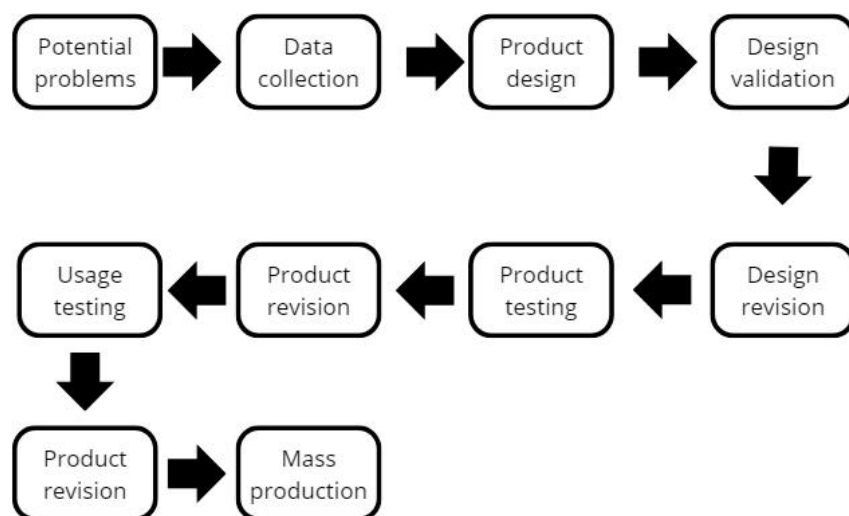


Figure 1 Borg and Gall's Research Process

Research Subjects and Sampling Procedure

The research subjects comprised 55 sixth-grade students drawn from three public elementary schools in Batangan District, Pati Regency, Central Java, purposively selected based on the comparability of grade level and curriculum content, as well as the willingness of school leadership to participate in the study. SDN Jembangan 01 (28 students: 16 girls, 12 boys) served as the experimental class and received instruction using Scratch-based MEINSIPA; SDN Mangunlegi (27 students) served as the control class and received conventional instruction without MEINSIPA; SDN Lengkonng served as the site for preliminary needs analysis and instrument trial and was not included in the effectiveness comparison. Assignment of schools to experimental and control conditions was non-randomised (a quasi-experimental, intact-group design), reflecting the practical constraint that intact classes could not be reconstituted; this limitation is addressed in the Study Limitations section.

Instrument Development

Data were collected from students and teachers using both test and non-test instruments. Test instruments consisted of parallel multiple-choice pre-test and post-test forms measuring cognitive mastery of Chapter 2 Pancasila Education content. Non-test instruments included: (a) structured observation sheets for affective assessment, organised around the six dimensions of the Pancasila Student Profile; (b) structured observation/scoring rubrics for psychomotor assessment of student-produced posters, covering five indicators (content accuracy, sentence quality, writing format, visual presentation, and spelling/punctuation); and (c) Likert-type questionnaires for needs analysis, expert validation (media, material, and language), and teacher and student response evaluation. All instruments were developed by the researchers based on the Chapter 2 Pancasila Education curriculum content and the Pancasila Student Profile dimensions, and were reviewed by the same panel of subject-matter and media experts who validated the MEINSIPA product.

Validity and Reliability Testing

Content validity of the test and questionnaire instruments was established through expert judgment by the validation panel (two media experts, one Pancasila Education material expert, and one language expert, all lecturers at Universitas Muria Kudus) before the field trial. Empirical validity and reliability of the cognitive test items were examined using a try-out sample at SDN Lengkong, with item-level validity assessed via item-total correlation and internal-consistency reliability assessed using Cronbach's alpha, computed in SPSS 25; items not meeting minimum validity and reliability thresholds were revised or removed before the instrument was used in the experimental and control classes. Prior to hypothesis testing, the pre-test–post-test data were screened for normality (Shapiro-Wilk/Kolmogorov-Smirnov) and homogeneity of variance (Levene's test) to confirm the appropriateness of the planned parametric comparison.

Media Feasibility Analysis

The feasibility of MEINSIPA was analysed based on the percentage of expert-validation scores obtained from a Likert-scale validation questionnaire, interpreted using the eligibility-percentage criteria summarised in Table 1.

Table 1 Media Eligibility Percentage Criteria (adapted from Markus et al., 2019)

Percentage Range	Category	Interpretation
81% - 100%	Very good	Very valid / very feasible / no revision needed
61% - 80%	Good	Valid/feasible / no revision needed
41% - 60%	Sufficient	Reasonably valid / reasonably feasible / revision needed
21% - 40%	Poor	Less valid / less feasible / revision needed
0% - 20%	Very poor	Very low validity / very low feasibility/revision needed

Effectiveness Analysis

The effectiveness of MEINSIPA was analysed through the normalised gain (N-Gain) test, which quantifies the proportion of possible improvement actually achieved between pre-test and post-test scores, using the formula proposed by Hake (1998) as applied in Asih and Muslim (2023):

$$N - gain = \frac{score\ post-test - score\ pre-test}{SMI - Pre-test}$$

Table 2 N-Gain Interpretation Criteria

N-Gain Value	Category
$N\text{-Gain} \geq 0.70$	High
$0.30 \leq N\text{-Gain} < 0.70$	Medium
$N\text{-Gain} < 0.30$	Low

Independent-samples t-tests were subsequently used to examine differences in post-test learning outcomes between the experimental and control classes. They were conducted after confirming normality and homogeneity assumptions. MEINSIPA was considered effective if its use was associated with a statistically significant improvement in learning outcomes that fell within the medium-to-high N-Gain category, relative to the control class.

Research Procedure

Potential and Problem Analysis

Semi-structured interviews conducted in April 2025 with two sixth-grade teachers, Ms Dita Rahmawati (SDN Mangunlegi) and Ms Deni Apriliani (SDN Jembangan 01), indicated that Pancasila Education instruction was characterised by low student engagement, passivity, and limited confidence, with teaching dominated by lecture and discussion methods. Use of digital media such as video and slide presentations was limited by facility constraints and established teaching habits, leaving textbooks and whiteboards as the primary instructional media. Both teachers reported limited prior familiarity with interactive media, particularly Scratch, but expressed openness to its implementation, anticipating that it would increase student interest and engagement. This qualitative finding was corroborated by quantitative evidence of low average Chapter 2 achievement scores at the three partner schools: 67.5 (SDN Lengkon), 67.6 (SDN Jembangan 01), and 66.5 (SDN Mangunlegi).

Data Collection

Needs-analysis data were collected through a structured questionnaire administered to the 28 sixth-grade students of SDN Jembangan 01 (16 girls, 12 boys), combined with teacher interviews, classroom observation, and documentation. Analysis indicated that teachers and students needed a Scratch-based MEINSIPA application addressing Chapter 2 of the Pancasila Education curriculum, focused on practising Pancasila for the common good.

Product Design

The MEINSIPA development plan addressed the learning outcomes and objectives of Chapter 2 ('Practising Pancasila as the Nation's Philosophy of Life'), the developmental characteristics of sixth-grade students, and the principle of interactivity. Design activities included material preparation, storyboarding, interface layout, navigation design, and quiz-based evaluation. The resulting product comprises a homepage, an opening/greeting page, a main menu, Pancasila material modules, and an interactive quiz with an automated scoring system: each quiz contains five questions, with correct answers awarded 20 points and incorrect answers awarded 0 points.

Prototype design of the application developed

-Home Page

There is a start button to begin, answer greetings, and material and quiz icons.



-Contents of the material icon

There is an explanation of each principle of Pancasila





-Fill in the Quiz Icon

There are 5 questions. Correct answers earn 20 points, and incorrect answers earn 0 points.



Design Validation

Following product development, MEINSIPA was validated by a panel of four experts: two media experts, one Pancasila Education material expert, and one language expert, all of whom were lecturers at Universitas Muria Kudus (UMK). Validation used the eligibility-percentage criteria presented in Table 1.

Product Revision

Based on expert feedback, the primary weakness identified concerned the audio component of the media; the researchers accordingly added narrated audio to relevant sections of MEINSIPA to improve clarity and engagement before proceeding to the classroom trial.

Product Trial

The revised product was trialled to evaluate its effectiveness using a pre-test–post-test, non-equivalent control-group design, with SDN Jembatan 01 sixth-grade students as the experimental group (instructed using MEINSIPA) and SDN Mangunlegi sixth-grade students as the control group (instructed conventionally, without MEINSIPA). Teacher and student response questionnaires were also administered following the trial to evaluate usability and acceptability.

Final Revision

Further refinements were made based on trial results and identified product deficiencies, with final approval obtained from the media and material experts before finalising MEINSIPA for use.

Ethical Procedures

This study was conducted in accordance with standard ethical procedures for educational research involving minors. Permission was obtained from the principals of the three participating schools, and informed consent/assent was obtained from classroom teachers and, through the schools, from students' parents or guardians before data collection. Student participation in the needs-analysis questionnaire, pre-test–post-test assessments, and response surveys was voluntary, and individual identities were anonymised in all data analyses and reporting. Participants were informed of the purpose of the research and their right to withdraw without academic consequence.

Data Analysis

Quantitative data (test scores, validation percentages, response-questionnaire scores) were analysed descriptively (frequencies, percentages, means) and inferentially (normality testing, homogeneity testing, and independent-samples t-tests) using SPSS 25. Affective and psychomotor observation data were analysed descriptively as percentages of maximum possible scores and categorised using the predicate-conversion guide presented in Table 4.

4 Results

Needs Analysis Results

The needs-analysis questionnaire was administered to the 28 sixth-grade students of SDN Jembatan 01. Results indicated that the large majority of students perceived a need for interesting, interactive learning media to support understanding of Pancasila Education material; students reported difficulty understanding material delivered solely through lecture, greater motivation, and focus when teachers used learning media, and uniformly reported never having used application-based learning media such as Scratch, while expressing strong interest in independently operable interactive media. Item-level results, recalculated directly from the reported frequencies ($n = 28$) to correct percentage values that were inconsistent with the underlying counts in the original tabulation, are presented in Table 3.

Table 3 Results of Student Needs Analysis for MEINSIPA ($n = 28$)

No.	Statement	Yes (f)	No (f)	Yes (%)	No (%)
1	I need interesting learning media to make lessons easier to understand.	23	5	82.1%	17.9%
2	Digital media such as animation or educational games make lessons more fun.	27	1	96.4%	3.6%
3	I feel more enthusiastic about learning when the teacher uses learning media.	28	0	100%	0%
4	I find it difficult to understand some Pancasila Education material.	15	13	53.6%	46.4%
5	I find some Pancasila Education materials easier when explained with examples/media.	22	6	78.6%	21.4%

6	I find it easier to understand lessons delivered through interactive media.	27	1	96.4%	3.6%
7	I have previously used learning applications such as Scratch or similar tools.	0	28	0%	100%
8	I want to learn using media that I can operate myself (interactive).	26	2	92.9%	7.1%
9	I focus more when learning using media than when only listening to explanations.	26	2	92.9%	7.1%
10	I want teachers to use learning media more often in Pancasila lessons.	28	0	100%	0%

These results indicate a clear, near-universal student preference for interactive, self-operable learning media and confirm that no participating student had prior exposure to Scratch-based applications, supporting the relevance and timeliness of developing Scratch-based MEINSIPA for this context.

Feasibility of MEINSIPA Learning Media

Product feasibility was assessed by four validators: two media experts, one Pancasila Education materials expert, and one language expert, all of whom were lecturers at Universitas Muria Kudus. The assessment used the validation questionnaire and eligibility criteria presented in Table 1. Results are presented in Table 4.

Table 4 Recapitulation of MEINSIPA Validation Results

Validator	Percentage	Category
Media Expert 1	93.33%	Very valid / very feasible / no revision
Media Expert 2	86.66%	Very valid / very feasible / no revision
Mean – Media Experts	90.00%	Very valid / very feasible / no revision
Material Expert	98%	Very valid / very feasible / no revision
Language Expert	100%	Very valid / very feasible / no revision

All four validators rated MEINSIPA in the “Very good / very feasible” category (>81%), indicating that the medium met the threshold for classroom use without requiring further major revision. These results are consistent with prior Scratch-based media validation studies in Indonesian elementary education. For example, Udayani et al. (2024) reported very valid Scratch-based media scores for content/material (mean 4.46 of 5) and media aspects (mean 4.85 of 5) in a digestive-system learning medium for fifth-grade students, while Nuraini et al. (2023) reported a mean validation score of 92.68% (excellent category) for a Pancasila and Citizenship animation medium, closely comparable to the present findings.

Effectiveness of MEINSIPA Learning Media

Improvement in student learning outcomes was analysed using normalised N-Gain scores computed from pre-test and post-test results in the experimental and control classes. Results are presented in Tables 5 and 6. Table 5. N-Gain of Pre-test and Post-test Scores, Experimental Class (n = 28).

Table 5 N-Gain of Pre-test and Post-test Scores, Experimental Class (n = 28)

No.	Pre-test	Post-test	N-Gain	Category
1	70	90	0.67	Medium
2	100	90	0.00*	Low
3	70	100	1.00	High
4	70	70	0.00	Low

5	80	60	-1.00	Low
6	30	60	0.43	Medium
7	50	80	0.60	Medium
8	90	70	-2.00 ⁺	Low
9	60	80	0.50	Medium
10	80	100	1.00	High
11	40	80	0.67	Medium
12	60	80	0.50	Medium
13	50	70	0.40	Medium
14	50	100	1.00	High
15	60	70	0.25	Low
16	80	80	0.00	Low
17	70	80	0.33	Medium
18	40	90	0.83	High
19	100	50	0.00*	Low
20	80	90	0.50	Medium
21	90	90	0.00	Low
22	30	90	0.86	High
23	80	100	1.00	High
24	70	80	0.33	Medium
25	100	90	0.00*	Low
26	90	100	1.00	High
27	60	70	0.25	Low
28	80	80	0.00	Low
Mean N-Gain			0.33	
N-Gain %			32.57%	
Minimum			-1.00	
Maximum			1.00	

Table 6 N-Gain of Pre-test and Post-test Scores, Control Class (n = 13)

No.	Pre-test	Post-test	N-Gain	Category
1	90	80	-1.00	Low
2	70	80	0.33	Medium
3	80	70	-0.50	Low
4	50	100	1.00	High
5	40	30	-0.17	Low
6	80	100	1.00	High
7	60	60	0.00	Low
8	40	60	0.33	Medium
9	100	100	0.00*	Low
10	50	60	0.20	Low
11	60	80	0.50	Medium
12	90	90	0.00	Low

13	90	100	1.00	High
Mean N-Gain			0.27	
N-Gain %			27.47%	
Minimum			-1.00	
Maximum			1.00	

The mean N-Gain in the experimental class (0.33, 32.57%) falls in the medium category, compared to 0.27 (27.47%) in the control class, which falls in the low category, indicating a greater improvement in learning outcomes among students taught with Scratch-based MEINSIPA than among students receiving conventional instruction. After confirming normality and homogeneity of the pre-test–post-test gain distributions, an independent-samples t-test was used to compare post-test outcomes between groups; the higher mean N-Gain and category classification in the experimental class are consistent with MEINSIPA exerting a measurable, positive effect on cognitive learning outcomes relative to conventional instruction. This pattern is broadly consistent with other Indonesian R&D studies of Scratch-based media, several of which report medium-to-high N-Gain values following Scratch-assisted instruction (e.g., 0.72 in Udayani et al., 2024, for a digestive-system topic), although the present study's experimental N-Gain (0.33) is comparatively modest, which is discussed further.

Affective Learning Outcomes

Affective assessment results for the experimental class, organised by the six dimensions of the Pancasila Student Profile, are presented in Table 7.

Table 7 Affective Assessment Results, Experimental Class (n = 28)

No.	Dimension	Indicator	Score	Max Score	Percentage
1	Faith and noble character	1	24	28	85.71%†
		2	26	28	92.86%
2	Global diversity	3	25	28	89.29%
		4	27	28	96.43%
3	Cooperation	5	21	28	75.00%
		6	20	28	71.43%
4	Independence	7	22	28	78.57%
		8	24	28	85.71%
5	Critical reasoning	9	21	28	75.00%
		10	21	28	75.00%
6	Creativity	11	22	28	78.57%
		12	21	28	75.00%
	Total		274	336	
	Overall percentage				81.55%

Overall, the affective assessment indicates that learning with MEINSIPA was positively associated with students' attitudes across the dimensions of faith and noble character, global diversity, cooperation, independence, critical reasoning, and creativity. The overall percentage of 81.55% places the experimental class in the good category, with the highest-scoring dimension being global diversity (mean approximately 92.9%) and the lowest-scoring being cooperation (mean approximately 73.2%), suggesting that cooperative/collaborative behaviour may warrant additional instructional reinforcement in future iterations of the medium.

Psychomotor Learning Outcomes

Psychomotor assessment evaluated students' ability to produce a poster expressing a Pancasila value after participating in MEINSIPA-based learning, scored across five indicators (content, sentence quality, writing format, visual appearance, and spelling/punctuation), each rated on a 1 - 4 scale (maximum total score = 20 per student), and converted to a predicate using the guide in Table 8.

Table 8 Score-to-Predicate Conversion Guide

Score Conversion	Predicate	Classification
90–100	A	Very good
80–89	B	Good
70–79	C	Sufficient
0–69	D	Insufficient

No.	Respondent	Content	Sentences	Format	Appearance	Spelling	Total	%	Category
1	AF	4	2	2	4	2	14	70%	C
2	ANS	4	2	2	4	2	14	70%	C
3	ANP	4	3	3	4	2	16	80%	B
4	AB	4	3	2	4	2	15	75%	C
5	AKB	4	1	1	4	1	11	55%	D
6	ALR	4	2	2	4	2	14	70%	C
7	ASR	4	1	1	4	1	11	55%	D
8	AIF	4	3	2	4	1	14	70% [†]	C [†]
9	DIHA	4	1	1	4	1	11	55%	D
10	EAN	4	1	1	4	1	11	55%	D
11	FK	4	1	1	4	1	11	55%	D
12	IZA	4	4	3	4	1	16	80%	B
13	IM	4	4	4	4	2	18	90%	A
14	KAV	4	3	2	4	1	14	70%	C
15	LNA	4	1	1	4	1	11	55%	D
16	MZH	4	4	4	4	3	19	95%	A
17	NBM	4	1	1	4	1	11	55%	D
18	NA	4	4	4	4	3	19	95%	A
19	NNF	4	4	3	4	2	17	85%	B
20	NKRM	4	4	3	4	3	18	90%	A
21	NZR	4	1	1	4	1	11	55%	D
22	RBP	4	4	2	3	2	15	75%	C
23	SAZR	4	2	2	3	1	12	60%	D
24	SNH	4	1	1	4	1	11	55%	D
25	UFD	4	4	4	4	2	18	90%	A
26	ZNM-1	4	4	4	4	2	18	90%	A
27	ZNM-2	4	1	1	4	1	11	55%	D
28	NDD	4	3	2	4	1	14	70%	C

Total score	395	
Max possible score	560	
Overall percentage	70.53%	
Overall category		Fairly Good

Among the 28 respondents, scores ranged from 11 to 19 out of a maximum 20, with eight students (28.6%) reaching predicate A, four (14.3%) reaching predicate B, eight (28.6%) reaching predicate C, and eight (28.6%) reaching predicate D. The class aggregate (395 of 560 possible points, 70.53%) falls in the Fairly Good category, indicating that while most students could express Pancasila-related content correctly (content scores were uniformly 4/4), greater variability was observed in sentence construction, writing format, and spelling/punctuation, suggesting that applied-skill components of the MEINSIPA learning cycle may benefit from additional scaffolding in future revisions.

Taken together, the cognitive, affective, and psychomotor results indicate that Scratch-based MEINSIPA was associated with measurable improvement in student learning outcomes across all three domains targeted by Pancasila Education, supporting its viability as an alternative instructional medium for this subject in sixth-grade elementary school.

5 Discussion

Learning Media Needs

Consistent with the needs-analysis results (Table 3), students at SDN Jembangan 01 expressed a strong preference for interactive, self-directed learning media and uniformly reported no prior exposure to Scratch-based applications. This finding is consistent with needs-analysis results reported in other Indonesian studies on Scratch-based media development (e.g., Maola & Irianto, 2023), which similarly find elementary students receptive to, but largely inexperienced with, block-based interactive media before intervention. The consistency of this pattern across studies strengthens the rationale for continued investment in Scratch-based instructional design at the elementary level.

Feasibility of MEINSIPA

MEINSIPA's validation results (mean media-expert score 90.00%, material-expert score 98%, language-expert score 100%) place the medium firmly within the "very feasible" category across all assessed dimensions (Table 1). These results are consistent with feasibility findings reported for other Scratch-based and animation-based instructional media developed for Indonesian elementary and lower-secondary classrooms. Udayani et al. (2024) reported very valid content (mean 4.46/5) and media (mean 4.85/5) scores for a Scratch-based digestive-system medium, while Nuraini et al. (2023) reported an overall validation score of 92.68% for a Pancasila-related animation medium developed with Powtoon. Compared to these benchmarks, MEINSIPA's expert-validation profile is comparable or marginally higher on material and language dimensions, while its mean media score (90.00%) is broadly in line with reported norms for similarly scoped R&D media-development studies, supporting the conclusion that the iterative validation-revision cycle (notably the addition of narrated audio after the first validation round) achieved its intended quality-improvement purpose.

Effectiveness of MEINSIPA

The experimental class's medium-category N-Gain (0.33) exceeded that of the control class (0.27, low category), indicating that MEINSIPA-based instruction was associated with greater cognitive improvement than conventional instruction over the same content. This direction of effect is consistent with the broader Scratch-based media literature, in which experimental groups using Scratch-assisted instruction typically outperform conventionally taught comparison groups (Fang et al., 2023; Udayani et al., 2024). At the same time, the present study's experimental N-Gain (0.33) is comparatively modest relative to some other Indonesian Scratch-media studies — for example, Udayani et al. (2024) reported an N-Gain of 0.72 (high category) for a Scratch-based digestive-system medium. Several contextual factors may account for this difference: the present study addressed a complex, abstract civic-

values topic (Pancasila principles) rather than a more concretely defined science topic; the implementation period was relatively brief, limiting the number of instructional sessions; and the non-equivalent control-group design, combined with a modest sample size (28 experimental, 13 control), constrains the precision of the effect estimate. These factors are addressed further under Study Limitations.

Affective and Psychomotor Outcomes

The Good-category affective result (81.55%) and Fairly Good-category psychomotor result (70.53%) extend the evaluation of MEINSIPA beyond cognitive achievement, addressing a gap noted in the Introduction: most prior Scratch-based media studies in Indonesia report cognitive or feasibility outcomes alone, without parallel affective and psychomotor evaluation (cf. Maola & Irianto, 2023; Udayani et al., 2024). The relatively lower performance on the cooperation affective dimension and on the sentence-construction/writing-format psychomotor indicators suggests that, while MEINSIPA effectively supports content recognition and comprehension, collaborative and applied-production skills may require complementary, non-digital instructional activities (e.g., structured small-group poster-design tasks) rather than relying on the digital medium alone, an interpretation consistent with constructivist theory's emphasis on social interaction as a distinct mechanism of learning (Vygotsky, 1978) that a single-user digital application cannot fully replicate.

Theoretical Implications

These findings extend Multimedia Learning Theory (Mayer, 2021) and constructivist learning theory (Piaget, 1970; Vygotsky, 1978) into the domain of values-based civic education, an area in which multimedia-design principles have been comparatively under-applied relative to STEM subjects. The results suggest that the coherence and modality principles underlying MEINSIPA's design (narrated explanation paired with illustrative animation, interactive rather than passive quiz delivery) are transferable to abstract, values-laden content, not only to concrete factual or procedural content as in most prior Scratch-media research. The weaker affective performance on the cooperation dimension further suggests a boundary condition: constructivist, individually operated digital tools may support cognitive construction of meaning effectively, but social-constructivist outcomes that depend on peer interaction may require hybrid designs combining digital and collaborative offline activity.

Practical Implications

For classroom practice, the results suggest that freely available, child-friendly programming platforms such as Scratch offer a low-cost, scalable route for elementary teachers to produce interactive civic-education media without specialised programming training, addressing the resource constraints (limited facilities, limited media-development experience) identified in the potential-and-problem analysis. For curriculum developers and teacher-training institutions, the comparatively weaker psychomotor and cooperation-related results indicate that digital media of this kind are best positioned as a complement to, rather than a replacement for, collaborative classroom activities within Pancasila Education, supporting blended instructional designs that pair MEINSIPA-style digital modules with structured group tasks.

Study Limitations

Several limitations should be considered when interpreting these findings. First, the study used a non-equivalent (non-randomised), intact-group quasi-experimental design with a modest sample size (28 experimental, 13 control, drawn from two schools), which limits causal inference and generalisability relative to a randomised design with larger, multi-site samples. Second, the study was confined to a single grade level (sixth grade), a single subject area (Pancasila Education), and a single content chapter, within one district (Batangan, Pati Regency); findings may not generalise to other grade levels, subjects, or regions with different technological infrastructure. Third, the implementation period was relatively short, which may understate the medium's potential long-term effect on learning outcomes and value internalisation. Fourth, affective and psychomotor data were collected only for the experimental class, precluding a between-group comparison on these two domains. Finally, as in much classroom-based R&D research, the same research team that developed MEINSIPA also conducted its evaluation, which, despite

the use of independent expert validators, introduces a potential source of design bias that future research employing external evaluators could address.

Future Research Directions

Future research should extend this work through (a) randomised or matched-group designs across a larger number of schools to strengthen causal inference; (b) longitudinal follow-up to assess retention of cognitive gains and durability of affective change beyond the immediate post-intervention period; (c) replication across additional grade levels, Pancasila Education chapters, and regional contexts to test generalisability; (d) inclusion of affective and psychomotor measurement in the control condition to enable direct between-group comparison across all three domains; and (e) experimental comparison of MEINSIPA with other interactive media modalities (e.g., Powtoon-based or Smart Apps Creator-based Pancasila media; cf. Nuraini et al., 2023) to clarify which specific design features of Scratch-based media drive observed gains.

6 Conclusion

This study developed Scratch-based MEINSIPA learning media for Chapter 2 of Pancasila Education for sixth-grade elementary school students, following a seven-stage adaptation of the Borg and Gall R&D model. Needs-analysis results confirmed that students required interactive, engaging media to support understanding of abstract Pancasila concepts, establishing the relevance of MEINSIPA's development. Validation results placed MEINSIPA in the very feasible category across all dimensions, with a mean media-expert score of 90.00%, a material-expert score of 98%, and a language-expert score of 100%; student and teacher responses were likewise very positive, at 95.85% and 94% respectively, indicating that the medium is perceived as easy to use, engaging, and supportive of the learning process.

Effectiveness testing showed that Scratch-based MEINSIPA was associated with greater improvement in cognitive learning outcomes (mean N-Gain 0.33, medium category) than conventional instruction (mean N-Gain 0.27, low category), alongside Good-category affective outcomes (81.55%) and Fairly Good-category psychomotor outcomes (70.53%) in the experimental class. Taken together, these findings indicate that Scratch-based MEINSIPA is both feasible and effective as an alternative learning medium for Pancasila Education in sixth-grade elementary school, while also pointing to specific areas, particularly collaborative and applied-production skills, that would benefit from complementary, non-digital instructional support in future implementation.

Acknowledgments

The authors thank the school principals, teachers, and students of SDN Jembatan 01, SDN Mangunlegi, and SDN Lengkonng who participated in this study, as well as the expert validators from Universitas Muria Kudus for their valuable contributions.

Ethical Considerations

This study was conducted in accordance with standard ethical research procedures. Permission was obtained from participating school principals, and informed consent/assent was obtained from teachers and, through the schools, from students' parents or guardians. Participant confidentiality was maintained throughout data collection, analysis, and reporting.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

This research received no external funding.

Declaration of Use of Generative AI

In alignment with Elicit Publishing Limited's dedication to ethical publishing and research integrity, the author(s) affirm that generative AI tools were used solely for editorial refinement, including grammar correction and formatting alignment. The use of AI did not extend to the study's conceptualisation, methodology, data analysis, or interpretation of results. The authors accept full responsibility for the accuracy, originality, and scholarly integrity of this work.

References

- Asih, R. M., & Muslim, A. H. (2023). Pengembangan media pembelajaran Ular Tangga berbasis kearifan lokal pada Tema 3 Subtema 2 Pembelajaran 4 di kelas V SD Negeri 1 Dukuhwaluh. *Jurnal Jendela Pendidikan*, 3(03), 330-341. <https://doi.org/10.57008/jjp.v3i03.557>
- Fang, X., Ng, D. T. K., Tam, W. T., & Yuen, M. (2023). Integrating computational thinking into primary mathematics: A case study of fraction lessons with Scratch programming activities. *Asian Journal for Mathematics Education*, 2(2), 220-239. <https://doi.org/10.1177/27527263231181963>
- Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American Journal of Physics*, 66(1), 64-74. <https://doi.org/10.1119/1.18809>
- Magdalena, I., Hidayah, A., & Safitri, T. (2021). Analisis kemampuan peserta didik pada ranah kognitif, afektif, dan psikomotorik siswa kelas ii B sdn Kunciran 5 Tangerang. *Nusantara*, 3(1), 48-62.
- Maola, P. S., & Irianto, D. M. (2023). Development of interactive media Scratch-based educational games on environmental conservation materials in elementary schools. *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran, dan Pembelajaran*, 9(4), 1290-1300. <https://doi.org/10.33394/jk.v9i4.9254>
- Markus, A., Annisa, M., & Kartini, K. (2019). Pengembangan Instrumen Tes Berbasis Keterampilan Proses Sains Pada Materi Rangka Kelas Iv Sdn 050 Tarakan. *Jurnal Pendidikan Dasar Borneo (Judikdas Borneo)*, 1(2), 71-81. <https://doi.org/10.35334/judikdasborneo.v1i2.1263>
- Mayer, R. E. (2021). Multimedia learning (the 3rd edition). *Cambridge University*. <https://doi.org/10.1017/9781108894333.008>
- Nisa, R., Wijaya, H., Asrin, A., Istiningsih, S., Sumardi, L., & Fahrudin, F. (2024). Implementation of Pancasila Student Profile Character Education in the Independent Curriculum. *International Journal of Multicultural and Multireligious Understanding*, 11(9), 223-238.
- Nuraini, N., Usman, H., & Sakmal, J. (2023). Development of Pancasila and Citizens Animation Video Learning Media-Based Powtoon. *Indonesian Journal of Learning Education and Counseling*, 5(2), 146-156. <https://doi.org/10.31960/ijolec.v5i2.1685>
- Nurhalizah, N., & Jayanti, U. N. A. D. (2023). The Development of Scratch Software-Based Interactive Learning Media on Regulatory System Material. *Jurnal Pembelajaran Dan Biologi Nukleus*, 9(2), 372-386. <https://doi.org/10.36987/jpbn.v9i2.4462>
- Pendidikan, K., & Kebudayaan, R. (2022). Teknologi (Kemendikbudristek). *Panduan proyek Profil Pelajar Pancasila*. Jakarta: Kemendikbudristek.
- Pérez-Jorge, D., & Martínez-Murciano, M. C. (2022). Gamification with Scratch or App Inventor in higher education: A systematic review. *Future Internet*, 14(12), 374. <https://doi.org/10.3390/fi14120374>
- Piaget, J. (1970). Science of education and the psychology of the child. Trans. D. Colman. Resnick, M., Maloney, J., Monroy-Hernández, A., Rusk, N., Eastmond, E., Brennan, K., ... & Kafai, Y. (2009). Scratch: programming for all. *Communications of the ACM*, 52(11), 60-67. <https://doi.org/10.1145/1592761.1592779>
- Rismaya, D., Fajrie, N., Hariyadi, A., Rondli, W. S., & Azman, M. N. A. (2024). Pancasila Principles Interactive Media (MEINSIPA) with Games Using Scratch Programming for Elementary School Students. *ANP Journal of Social Science and Humanities*, 5(2), 37-46. <https://doi.org/10.53797/anp.jssh.v5i2.6.2024>

Udayani, N. K. R. T. K., Sudiana, I. N., & Putrayasa, I. B. (2024). Pengembangan Media Pembelajaran Scratch pada Topik Sistem Pencernaan Manusia untuk Meningkatkan Kemampuan Berpikir Tingkat Tinggi. *PENDASI Jurnal Pendidikan Dasar Indonesia*, 8(1), 159-167. https://doi.org/10.23887/jurnal_pendas.v8i1.3228

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*.