

THE DEVELOPMENT OF INTERACTIVE MEDIA USING SCRATCH TO IMPROVE SOCIAL SCIENCE LEARNING OUTCOMES OF FIFTH GRADE STUDENTS AT SDN 101776 SAMPALI IN THE 2024/2025 ACADEMIC YEAR

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Abstract. This research aims to develop interactive media using the Scratch web application that is valid, practical, and effective in improving the learning outcomes in IPAS for fifth-grade students at SD Negeri 101776 Sampali in the 2024/2025 academic year. This type of research is Research and Development (R&D) using the 4D development model, which consists of four stages: (1) Define; (2) Design; (3) Development; and (4) Disseminate. The findings of this study are: (1) The feasibility of the media was determined based on validation results from subject matter, media, and language experts. The subject matter expert validation obtained a final score of 93.3% with a “Highly Feasible” criterion. Media expert validation was conducted in two stages: the first stage yielded a score of 83% (“Feasible” with revisions), and the second stage reached 90.6% (“Highly Feasible”). Language expert validation scored 89% (“Highly Feasible”). (2) The practicality of the media was measured through practicality questionnaires distributed to teachers and students. The teacher’s response showed a practicality score of 88% (“Highly Practical”), and the students’ response was 90% (“Highly Practical”). (3) The effectiveness of the media was evaluated by the gain test result was 0.71, categorized as “Very High,” indicating that the interactive media “Scratch” has a high level of effectiveness in improving learning outcomes. The conclusion of this research is the developed Scratch interactive media is valid, practical, and effective for enhancing student learning outcomes in the IPAS subject for Grade V at SD Negeri 101776 Sampali

Keywords: interactive media; scratch; learning outcomes; IPAS.

I. INTRODUCTION

Education serves as a fundamental pillar in the development of a nation, as it fosters individuals who are intelligent, well-rounded, and capable of actively contributing to society. Through quality education, students can acquire knowledge, skills, and values essential for life. Consequently, the Indonesian government continues to reform its educational system, including curriculum development. The transition from the 2013 Curriculum to the Merdeka Curriculum represents a strategic effort to address contemporary challenges and promote flexible, contextual, and student-centered learning [1]. Education is also a deliberate effort to create a learning environment that enables learners to explore their potential and develop moral intelligence, character, and active citizenship, as outlined in Law No. 57 of 2021.

Within this curriculum, Social Studies and Natural Sciences are integrated into a new subject called IPAS (Ilmu Pengetahuan Alam dan Sosial), aiming to cultivate critical thinking and environmental and social awareness from an early age [2]. However, the implementation of IPAS in elementary schools, particularly in Grade V at SD Negeri 101776 Sampali, still faces significant challenges.

Preliminary observations conducted by the researcher revealed that student learning outcomes in IPAS were relatively

low. In July 2024, only 36.67% of students achieved scores above the minimum mastery criterion (KKTP), with an average score of 51. Although the average score increased to 69.2 in August, it still fell short of the target score of 70. Interviews with teachers indicated that classroom instruction remains heavily reliant on conventional lecturing methods, with minimal use of interactive media. The learning materials used were limited to static images found in textbooks or printed on paper, which failed to engage students or encourage exploration. These findings align with the research of [3], who reported that low student achievement was closely related to the use of conventional lecture methods and the absence of innovative teaching media. [4] also stated that in some classrooms, especially in IPAS, the absence of interesting media led to student boredom and poor performance.

Learning outcomes are defined as the abilities acquired by students after undergoing the learning process for a specific period, commonly measured through tests [5]. These outcomes can be observed after instructional activities and are reflected in behavior or score changes [6]. The cognitive domain is often the primary focus for teachers in schools, as it directly relates to students’ mastery of learning content [7]. Cognitive learning outcomes include knowledge,

comprehension, application, analysis, synthesis, and evaluation [8].

Instructional media plays a crucial role in helping teachers present material more clearly, attractively, and understandably. According to [9], the use of instructional media simplifies the delivery of material so that it can be easily understood by students. [10] state that media makes the learning process more interesting and improves learning outcomes. Media also prevents students from becoming bored and helps explain abstract content more effectively [11].

Interactive media not only serves as a visual aid but also creates a more dynamic learning environment that actively involves students. It facilitates two-way communication between the media and the user, enabling students to become active participants rather than passive listeners [12]. According to [13], interactive media combines visual and audio elements, allowing students to not only see and hear but also experience learning through interaction.

[14] found that interactive media is highly valid in terms of content, language, and design, and very practical according to both teacher and student feedback. Similarly, [15] emphasized that interactive instructional media is valid, practical, and effective for improving learning outcomes.

Scratch, a visual programming platform developed by the MIT Media Lab, emerges as a promising tool for educational use. It allows educators to develop engaging instructional materials, such as animations, simulations, and educational games, and is user-friendly even for beginners [16]. Scratch is still rarely used in education, with only 8% of users applying it in learning environments due to unfamiliarity and perceived technical challenges.

Despite these challenges, Scratch has been shown to enhance creativity and critical thinking in students. [17] demonstrated that Scratch-based game media is valid, practical, and effective for use in the classroom. [18] also confirmed that Scratch media significantly improves higher-order thinking skills and is highly feasible for instructional use.

Based on the needs analysis and field findings, it is necessary to develop an innovative interactive learning media to address the low performance in IPAS among Grade V students at SD Negeri 101776 Sampali. The use of Scratch in media development is a strategic choice as it integrates visual, audio, and interactive controls to enhance students' comprehensive understanding of the material. This media is expected to assist teachers in delivering IPAS content in a more enjoyable and meaningful way, thereby increasing student motivation and academic achievement. Considering these urgencies, the current study entitled *"Development of Interactive Media Using Scratch to Improve Learning Outcomes in IPAS for Grade V Students at SD Negeri 101776 Sampali in the 2024/2025 Academic Year"* is both timely and significant.

II. RESEARCH METHOD

This study employs a Research and Development (R&D) approach aimed at producing an interactive learning media based on Scratch to enhance student learning outcomes in the IPAS (Integrated Science and Social Studies) subject for Grade V students at SD Negeri 101776 Sampali. R&D is a

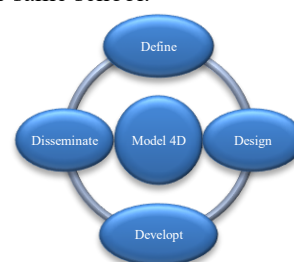
method implemented systematically to develop or improve a product through validation to ensure its accountability and superiority [19]. According to [20], R&D is a deliberate and systematic research method to discover, enhance, develop, and test the effectiveness of new, efficient, and meaningful products, models, or strategies. This methodology is suitable for studies that not only evaluate existing conditions but also produce innovative products that undergo validation for feasibility, practicality, and effectiveness.

The research was conducted at SD Negeri 101776 Sampali, located in Deli Serdang District, North Sumatra Province, during the odd semester of the 2024/2025 academic year. The study involved 30 fifth-grade students and four expert validators, consisting of subject matter experts, media experts, language experts, and a Grade V homeroom teacher who acted as the practitioner.

The study adopted the 4D development model proposed by Thiagarajan, which consists of four phases: Define, Design, Develop, and Disseminate [21]. The Define stage included a need analysis conducted through classroom observation and teacher interviews to identify learning problems and instructional gaps. This stage also involved student analysis, task analysis based on Learning Outcomes (CP) and Objectives (ATP), and instructional objective formulation.

The Design phase involved the development of Scratch-based instructional media, the alignment of teaching materials with the Merdeka Curriculum, and the preparation of evaluation instruments, including validation questionnaires and pretest-posttest items. According to [22], this design process must pay close attention to content structure, pedagogy, visual layout, and language to ensure learning objectives are met effectively.

In the Develop stage, the product was validated by subject matter, media, and language experts. The validation results guided revisions, which were followed by field testing to determine effectiveness and practicality. The final stage, Disseminate, consisted of limited product distribution among teachers within the same school.



Picture I Development model 4D

The interactive learning media was created using Scratch, a visual programming tool, and was designed to feature engaging and easy-to-navigate content for students. It included key components such as a cover page, main menu, instructional guide, core materials, educational videos, interactive quizzes, and educational games. This structure emphasized clarity, appropriate language level, and interactive features to support students' cognitive engagement. The

following is the navigation structure of the Scratch-based learning media:

TABLE I Scratch Media Navigation Structure

No	Page	Main Content	Navigation Purpose
1	Cover Page	Media title, animated teacher character	Start button to begin
2	Name Input	Student enters name to proceed	Leads to main menu
3	Main Menu	Options: guide, materials, video, quiz, games	Central navigation
4	Learning Materials	Interactive text on Earth's layers	Supports concept comprehension
5	Video Learning	Educational videos on Earth's layers (YouTube-based)	Reinforces visual learning
6	Quiz	5 multiple choice questions (20 points each)	Assess cognitive learning outcome
7	Interactive Games	Clicker and chase-style Scratch games	Motivate and reinforce learning
8	Motivation Page	Encouraging quotes for student morale	Closure of the learning experience

The instruments used in this study included structured interview protocols, expert validation forms, practicality questionnaires for both students and teachers, and pretest-posttest questions. Validation tools were assessed using a four-point scale, ranging from “very poor” to “excellent,” to determine the product’s feasibility [23].

Effectiveness was evaluated using normalized gain scores (g) to compare pretest and posttest results. The scoring interpretation followed the criteria outlined by Sugiyono (2017), which categorized gains as low ($g < 0.3$), medium ($0.3 \leq g < 0.7$), or high ($g \geq 0.7$). Meanwhile, practicality was measured based on feedback from teachers and students. If the average rating reached $\geq 85\%$, the product was classified as “Very Practical.”

To support the validity of findings, descriptive qualitative methods were used to analyze observational and interview data, while quantitative methods were applied to process questionnaire and test score data. Data collection methods included interviews, observations, and questionnaires. Observation served as a non-instrumental method for understanding classroom dynamics. Meanwhile, interviews helped identify instructional needs and existing teaching conditions.

Through the structured 4D development process, this study aims to produce a valid, practical, and effective interactive learning media to improve IPAS learning outcomes. The Scratch-based media serves not only as an instructional aid but also as a motivational tool that increases student engagement. Additionally, this research contributes to the integration of educational technology in the implementation of the Merdeka Curriculum at the elementary level. The resulting product can also serve as a replicable model for similar innovations in primary education and a reference for future research in media-based learning interventions.

III. RESULTS AND DISCUSSION

The results and discussion of this study present a comprehensive explanation of the development process and evaluation of a Scratch-based interactive learning media aimed at improving IPAS learning outcomes among fifth-grade students at SD Negeri 101776 Sampali. Through a systematic application of the 4D development model Define, Design, Develop, and Disseminate this research outlines each stage in detail, starting from the identification of instructional needs, media design, expert validation, effectiveness and practicality testing, to limited dissemination. The findings provide empirical evidence on the feasibility, effectiveness, and practicality of the developed media, highlighting its potential as a powerful digital learning tool that aligns with the objectives of the Merdeka Curriculum and supports meaningful, engaging, and student-centered learning [24].

1. Define

The define stage aimed to identify instructional needs and real problems in the field. Through classroom observation, documentation analysis, and interviews with teachers and the principal at SD Negeri 101776 Sampali, it was found that IPAS (Integrated Science and Social Studies) learning was still predominantly conventional. The delivery relied heavily on lectures and lacked the use of interactive media, resulting in low student engagement and suboptimal learning outcomes [25].

Teachers reported difficulty in delivering abstract topics such as the Earth’s layers and landforms. Moreover, student analysis revealed diverse learning styles (visual, auditory, and kinesthetic), which had not been adequately accommodated in existing teaching methods. Hence, Scratch-based interactive media was identified as a potential tool to visualize abstract IPAS content and deliver more engaging learning experiences.

In addition, a task analysis was conducted based on the learning outcomes (CP) and learning objectives (ATP) of the Merdeka Curriculum. This was essential to ensure that the instructional media content aligned with curriculum goals and students’ cognitive development.

2. Design

Based on the findings from the define stage, the instructional media was designed using Scratch, focusing on the topic “What’s on Earth?” which includes lithosphere, hydrosphere, and atmosphere. Content was derived from official teaching modules, teacher’s books, and student textbooks, and adapted into interactive components [26].

The Scratch media included several features: a dynamic cover page, student name input, main menu (materials, videos, quizzes, games), animated material presentations, five multiple-choice interactive quiz questions with scoring, and educational games such as a chase game and clicker game. The first design is :

TABLE II DESIGN SCRATCH MEDIA

Page 1	Page 2
Page 3	Page 4
Page 5	Page 6
Page 7	Page 8
Page 9	Page 10
Page 11	Page 12
Page 13	Page 14
Page 15	Page 15



Assessment instruments were also designed, including expert validation questionnaires, practicality surveys, and pretest-posttest items to evaluate the media's effectiveness. The test items were validated by experts and showed high reliability ($r = 0.702$). The entire design focused on visual appeal, ease of navigation, and compatibility with students' developmental characteristics [27].

3. Development

a. Validity Test

The validity of the media was evaluated by three experts: content, media, and language.

- The content expert rated the media at 93% (very feasible), confirming that the material was accurate, relevant, and well-organized.
- The media expert conducted two rounds of evaluation. The initial score was 83% (feasible with revisions). After improvements in layout, video clarity, and navigational flow, the score increased to 90.6% (very feasible).
- The language expert gave a score of 89% (very feasible), citing appropriate diction, readability, and grammar use. The overall feasibility average reached 91%, indicating that the media is of high quality and suitable for use in the classroom [28].

b. Effectivity Test

Effectivity test was assessed by comparing students' pretest and posttest results.

- The average pretest score was 65, while the posttest score rose to 90.
- The normalized gain score (g) was calculated at 0.72, categorized as "high effectiveness"

This outcome demonstrates a significant increase in students' conceptual understanding after using the media. Classroom observations also showed increased student engagement, attentiveness, and enjoyment during the learning sessions. These findings are consistent with prior research by [29], which emphasized Scratch's ability to improve learning outcomes and motivation.

c. Practicality Test

Practicality was assessed through surveys completed by the classroom teacher and students.

- The teacher scored the media at 88% (very practical), noting ease of use, visual appeal, and its support for learning objectives.
- The students rated the media at 90%, indicating the interface was accessible, enjoyable, and helpful for understanding IPAS material. The average practicality score reached 89%, which qualifies the media as very practical for classroom implementation.

4. Dissiminate

The final product was disseminated on a limited basis within SD Negeri 101776 Sampali. This approach enabled close monitoring and refinement based on feedback from teachers and students. Dissemination involved collaborative discussions to assess the media's strengths and areas for improvement [30].

Limited dissemination was chosen to ensure contextual relevance and adaptability before wider implementation. The development and usage of the Scratch media aligned with the goals of the Merdeka Curriculum, particularly in promoting meaningful, technology-integrated, and student-centered learning.

Based on the results obtained from the define, design, develop, and disseminate stages, the Scratch-based interactive media for IPAS instruction in Grade V is confirmed to be highly feasible, effective, and practical. The product was well-designed in response to students' needs and aligned with curriculum standards. Expert validation confirmed its instructional quality, and classroom implementation demonstrated its ability to significantly enhance student learning outcomes.

This interactive media successfully addressed the limitations of traditional instruction in IPAS, particularly in presenting abstract scientific content. By incorporating visual, auditory, and kinesthetic elements, it stimulated student interest and facilitated deeper understanding. The gain score of 0.72 reflected high effectiveness, and practicality ratings from both teachers and students exceeded expectations.

The conclusion, the Scratch-based media is highly recommended for wider adoption in elementary schools. It supports Merdeka Curriculum objectives and encourages innovation in digital education. Further development and application of this media to other topics and grade levels are strongly encouraged.

IV. CONCLUSIONS

Based on the results and discussion of this research and development study, it can be concluded that the Scratch-based interactive media developed in this study is feasible, effective, and practical for use in Grade V IPAS (Integrated Science and Social Studies) learning. First, in terms of feasibility, the media was evaluated by experts in content, media, and language. The content expert awarded a score of 93.3%, categorized as "very feasible." The media expert conducted two evaluation phases: 83% in the first stage and 90.6% in the second stage after revisions, both of which fall into the "very feasible" category. The language expert gave a score of 89%, also in the "very feasible" range. Second, the effectiveness test, conducted through pretest and posttest with 30 fifth-grade students, resulted in a normalized gain score of 0.71, which is classified as "high." This indicates that the use of Scratch-based media significantly improved student learning outcomes. Third, the practicality test, based on questionnaires distributed to teachers and students, showed that teachers gave a score of 88% and students provided an average of 90%, both of which are in the "very practical" category. Thus, the developed interactive Scratch media is proven to be highly practical, helping teachers deliver the material more easily and engaging students effectively. The implications of this study

suggest that the interactive Scratch media serves as an innovative instructional tool that supports meaningful and student-centered learning. First, it facilitates the teacher's role as a learning facilitator, allowing students to be more actively involved in both individual and group work, leading to improved learning outcomes. Second, this media allows students to revisit and review the topic "What's on Earth?" repeatedly, without time constraints, thus enabling more flexible and enjoyable learning experiences. Third, the use of Scratch-based media aligns with the objectives of the *Merdeka Belajar* (Independent Learning) policy and 21st-century education principles, fostering technology-integrated learning and developing students' critical thinking and digital literacy skills. The recommendations based on the research findings are as follows: (1) students who have access to personal or family-owned digital devices such as smartphones or laptops should be encouraged to use the Scratch-based interactive media independently at home as supplemental learning material due to its accessible and repeatable nature; (2) teachers are encouraged to improve their skills in designing and developing digital learning media, particularly using Scratch, to provide more engaging and technologically relevant instruction; (3) school principals are expected to support the availability of adequate digital learning infrastructure, especially devices needed for implementing interactive media in the classroom; and (4) future researchers may use the results of this study as a reference or foundational material in conducting similar studies related to the development of technology-based interactive learning media.

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