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Developing interactive SAC-based media to enhance elementary IPAS learning

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ABSTRACT

This research was conducted based on a needs analysis regarding interactive digital learning media to improve student learning outcomes in the IPAS subject. Teachers still predominantly use conventional methods and limited media, resulting in low student motivation and difficulty in understanding the material in depth. The low learning outcomes of students in the IPAS subject at SD Negeri 0401 Pasar Ujung Batu are caused by the minimal use of interactive learning media. The purpose of this study is to develop, test the feasibility, and examine the effectiveness of interactive learning media based on Smart Apps Creator (SAC) in improving the IPAS learning outcomes of fourth-grade elementary school students. The rationale for conducting this research lies in the demand for digital learning media that can enhance students' motivation, engagement, and comprehension of the learning material, particularly within the framework of the Merdeka Curriculum, which emphasizes more contextual and enjoyable learning. The method employed was Research and Development (RnD) using the Four-D model (Define, Design, Develop, Disseminate). The findings revealed that the developed media was deemed feasible by experts, highly practical by teachers and students, and effective in improving learning outcomes with a medium level of improvement. These results indicate that SAC-based interactive media can serve as a relevant and innovative learning solution in the digital era.

ABSTRAK

Penelitian ini dilakukan berdasarkan hasil analisis kebutuhan akan media pembelajaran digital yang interaktif untuk meningkatkan hasil belajar peserta didik dalam mata pelajaran IPAS. Guru masih dominan menggunakan metode konvensional dan media yang terbatas, sehingga peserta didik kurang termotivasi dan sulit memahami materi secara mendalam. Rendahnya hasil belajar peserta didik pada mata pelajaran IPAS di SD Negeri 0401 Pasar Ujung Batu yang disebabkan oleh minimnya penggunaan media pembelajaran interaktif. Tujuan dari penelitian ini adalah untuk mengembangkan dan menguji kelayakan serta efektivitas media pembelajaran interaktif berbasis Smart Apps Creator (SAC) dalam meningkatkan hasil belajar IPAS peserta didik kelas IV SD. Alasan dilakukannya penelitian ini adalah karena kebutuhan akan media pembelajaran digital yang mampu meningkatkan motivasi, keterlibatan, dan pemahaman peserta didik terhadap materi pembelajaran, khususnya pada Kurikulum Merdeka yang menuntut pembelajaran lebih kontekstual dan menyenangkan. Metode yang digunakan adalah penelitian pengembangan (Research and Development) dengan model Four-D (Define, Design, Develop, Disseminate). Hasil penelitian menunjukkan bahwa media yang dikembangkan dinyatakan layak oleh ahli, sangat praktis oleh guru dan peserta didik, serta efektif meningkatkan hasil belajar dengan kategori peningkatan sedang. Temuan ini menunjukkan bahwa media interaktif berbasis SAC dapat menjadi solusi pembelajaran yang relevan dan inovatif di era digital.

Kata Kunci: media belajar digital; media interaktif; SAC; Smart Apps Creator

INTRODUCTION

Educational programming for the Primary School level is regulated in the government-established curriculum, as specified in the Minister of Education, Culture, Research, and Technology Regulation No. 12 of 2024. This regulation designates the Kurikulum Merdeka as the fundamental framework and curricular structure for all educational units in Indonesia. The Kurikulum Merdeka encourages educators to use high-quality materials and methodologies tailored to students' competency levels, interests, and talents. For instance, the implementation of this curriculum at the Primary School level integrates the subjects of Natural Sciences (IPA) and Social Sciences (IPS) into a single unified subject known as Natural and Social Sciences (IPAS). This integration aims to enable students to understand and manage both their natural and social environments holistically (Nuryani *et al*., 2023).

Social Studies (IPS) instruction is implemented across all educational units, particularly in Primary Schools, to serve as a medium for developing students' potential and cultivating attitudes, moral values, and skills grounded in established conceptual foundations. Social Studies education represents a synthesis of social sciences presented according to pedagogical principles suitable for instruction at the school level (Nurjanah *et al*., 2021). On the other hand, Natural Science instruction plays a critical role in fostering logical, critical, and scientific thinking abilities through the observation of natural phenomena. These two academic fields, Social Studies and Natural Sciences, are integrated within the Kurikulum Merdeka into the subject of IPAS to provide a more contextual and unified learning experience (Sundari *et al*., 2023). Enhancing educational quality requires effective instruction, characterized by a smooth, well-defined progression aligned with predefined learning objectives. Formal educational institutions, particularly primary schools, are mandated to provide high-quality instruction to students. To achieve this qualitative improvement, educators are expected to transform, develop, and disseminate knowledge and technology through meaningful learning activities (Efendi & Sholeh, 2023).

Schools are expected to serve as exemplars in implementing a curriculum that is more flexible and aligned with students' specific needs. Currently, however, the instructional process remains heavily dependent on textbooks. This reliance on textbooks restricts the interaction between educators and students. Within the teaching and learning process at school, challenges are inevitably encountered. These range from students experiencing significant difficulty in comprehending lessons provided by the teacher to various obstacles faced by educators during the execution of classroom instruction (Zamil & Udyaningsih, 2021).

The initial observation activities conducted by the researcher at SD Negeri 0401 Pasar Ujung Batu did not solely focus on the grades of the Social Studies (IPS) subject as a component within the Natural and Social Sciences (IPAS) subject in the Kurikulum Merdeka, but also aimed to identify obstacles that disrupt the improvement of student learning outcomes during the instructional process. The selection of Social Studies (IPS) data as the primary focus was based on findings that student achievement in this component exhibited the most significant issues and was considered capable of representing the general condition of Natural and Social Sciences (IPAS) instruction in that specific classroom.

Furthermore, students had difficulty comprehending the material presented. This phenomenon is presumed to occur because they had not attained a comprehensive understanding during previous instructional sessions; consequently, as they progressed to subsequent topics, they encountered obstacles in synthesizing new knowledge with their existing conceptual frameworks (Rahma & Afifa, 2023). Student difficulties were exacerbated by a deficiency in supplementary literature or reading materials accessed by the students, and the instructional methods implemented by the teacher remained dominated by the lecture method. Although the lecture method offers advantages for delivering extensive material cost-effectively, it is less effective at stimulating student creativity and active participation. Without efforts to correlate the material with surrounding environmental phenomena, students tend to experience

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boredom, lack motivation, and exhibit a lack of enthusiasm in attending the lessons (Fortus & Touitou, 2021).

The development of interactive media is essential for enhancing learning outcomes. Interactive media is intended to support user participation (Murtopo *et al*., 2023). Interactive media is considered an alternative to maximize existing technological facilities. Students can utilize technology and media to enhance the quality of their learning. One application of interactive media is through the Smart Apps Creator (SAC) software. SAC-based interactive learning media are feasible, practical, and effective for use during study. Furthermore, the implications of SAC-based interactive learning media on the topic of constructing identity within diversity provide practical benefits in the execution of the teaching process for educators, offer ease of use, and have an effective impact on the learning process while improving student learning outcomes (Khasanah & Rusman, 2021).

The use of SAC-based interactive learning media provides students with opportunities to develop a critical understanding of the material on constructing identity within diversity. When students encounter difficulties in comprehending the content within the SAC-based interactive learning media, they are able to re-examine and reinforce their understanding of the provided material (Suhartati, 2021). SAC-based interactive learning media can support the development of instructional tools for schools and educational departments, as this media represents a novel breakthrough in the utilization of digital technology (Puspitasari *et al*., 2022). Despite the challenges inherent in developing SAC-based interactive learning media, this endeavor is expected to have significant potential to enhance instructional quality. With the assistance of SAC, it is anticipated that educators will be capable of creating learning applications that are engaging and enjoyable for students (Nofitasari *et al*., 2021). Through interactive features, images, and animations, instructional material can become more vivid and engaging for students. This integration is expected to facilitate an increase in student engagement and interest within the learning process.

Empirical studies concerning the development of SAC-based interactive learning media in an effort to enhance Natural and Social Sciences (IPAS) learning outcomes for primary school students remain relatively limited. Although various research projects have been conducted regarding the development of SAC-based interactive multimedia across diverse contexts, deeper exploration is still required, particularly focusing on the aspects of development, feasibility, and effectiveness of SAC-based interactive multimedia to support the improvement of student Natural and Social Sciences (IPAS) learning outcomes (Juniarti & Ramadan, 2021; Setiawan *et al*., 2023; Yessi, 2021). The necessity for the development of interactive multimedia arises as a response to the challenges of conventional instruction, which is often insufficient in capturing student attention and does not fully support deep conceptual understanding. Consequently, instructional media is required that is not only engaging and interactive but also capable of enhancing active student participation within the learning process. This research aims to describe the development process of SAC-based interactive multimedia, evaluate the feasibility level of the developed product, and examine its effectiveness in improving the Natural and Social Sciences (IPAS) learning outcomes of fourth-grade primary school students.

LITERATURE REVIEW

Learning Outcomes in IPAS Instruction

Learning outcomes represent the abilities acquired by students after undergoing a meaningful and directed instructional process. Within the context of Natural and Social Sciences (IPAS) instruction, learning outcomes encompass not only cognitive aspects but also psychomotor and affective dimensions (Zamil & Udyaningsih, 2021). Natural and Social Sciences (IPAS), as an integrative thematic subject, requires students to comprehensively understand concepts related to the environment, society, and science (Sari *et al*., 2024). Consequently, the success of students in Natural and Social Sciences (IPAS) can be

measured by the extent to which they are capable of integrating and applying such knowledge within real-world contexts (Rosiyani *et al*., 2024). Meaningful learning occurs when new information students receive can be connected to their prior knowledge. This aligns with the perspective of Ausubel, who asserts that the key to meaningful learning is the link between new information and existing cognitive structures (Alves *et al*., 2021). Educators must design instructional experiences that enable students to actively construct their knowledge, thereby ensuring that the learning process becomes more profound and sustainable (Muhardini *et al*., 2023).

In the instruction of Natural and Social Sciences (IPAS), students are expected to demonstrate the capacity for critical thinking, problem-solving, and comprehending the intricate relationships between humanity and the environment. Consequently, the instructional approach employed must facilitate active student engagement. The constructivist approach becomes highly relevant in this context, as it focuses on the processes of exploration, discussion, and reflection that enable students to construct their own understanding (Nadia & Erita, 2022). The Zone of Proximal Development (ZPD) emphasizes the critical role of the teacher or peers in assisting students to achieve their maximum potential (Wardani *et al*., 2023). Through social interaction and appropriate guidance, students are able to develop skills and understanding optimally. Consequently, Natural and Social Sciences (IPAS) learning outcomes serve as critical indicators for evaluating the effectiveness of the instructional processes implemented within the classroom (Muliantara, 2023).

Smart Apps Creator (SAC) Interactive Learning Media

Learning media serve as a bridge between teachers and students, facilitating effective delivery of material. In the digital era, the use of media based on information and communication technologies has become increasingly important because it can bridge diverse learning styles. Media not only function as a visual aid but also as a means to build conceptual understanding interactively (Rosyiddin *et al*., 2023). One interactive learning media that can be utilized is Smart Apps Creator (SAC). SAC is a desktop-based application that allows teachers or users to create learning applications without programming skills. This application supports various formats such as HTML5, .exe, and .apk, and it can be operated offline, which makes it an efficient alternative in various instructional conditions (Latif *et al*., 2021). The utilization of SAC in the development of instructional media enables the integration of text, audio, images, video, and animation into a single cohesive and interactive entity (Ferlianti *et al*., 2022). Interactive features such as quizzes, navigation buttons, and immediate feedback can enhance student engagement in learning.

IPAS Instruction Based on Interactive Multimedia

Interactive multimedia-based instruction is an approach that combines various media elements such as text, images, audio, animation, and video to create a rich and engaging learning experience (Maulidia, 2023). The primary advantage of interactive multimedia is its ability to give users control over the learning process, allowing them to navigate it according to their needs. Within the context of Natural and Social Sciences (IPAS), this is highly relevant because the material taught is complex and requires visual representation (Nabila & Ariani, 2023). Interactive multimedia not only presents information visually but also allows students to interact directly with the instructional content. This interactivity makes students more active in the learning process, which ensures that conceptual understanding becomes stronger. Furthermore, the utilization of multimedia can assist students with diverse learning styles, including visual, auditory, and kinesthetic (Trijayanti & Rosmiati, 2021).

Interactive media in Natural and Social Sciences (IPAS) instruction is capable of increasing learning interest, conceptual understanding, and material retention (Mas'ud *et al*., 2023). Furthermore, media such

as SAC are highly effective for overcoming student boredom and creating a learning atmosphere that is more enjoyable and challenging. Teacher support, a conducive learning environment, and psychological factors such as motivation and emotion also influence the effectiveness of Natural and Social Sciences (IPAS) instruction. A contextual and participatory approach is essential so that students feel a sense of involvement in their learning. Therefore, the integration of interactive multimedia such as SAC in Natural and Social Sciences (IPAS) instruction becomes an important strategy to improve student learning outcomes holistically (Syahputra & Prismana, 2021).

METHODS

The development procedure in this R&D research utilizes the Four-D Model (4D) development model developed by Thiagarajan et al in the book titled "Instructional Development For Training Teachers of Exceptional Children." The 4D model consists of four stages: 1) Define; 2) Design; 3) Develop; and 4) Disseminate. The define stage is the phase for establishing and defining instructional requirements by conducting initial observations regarding school conditions. This research was conducted at SD Negeri 0401 Pasar Ujung Batu. The subjects in this study were fourth-grade students, consisting of 14 male students and 10 female students, with a total of 24 students. The selection of the fourth grade was based on initial observation results indicating that student learning achievement in the IPS component of the Natural and Social Sciences (IPAS) subject was still low, and many had not reached the Minimum Mastery Criteria (KKM). Furthermore, the IPAS material at this level is consistent with the topics developed within the SAC-based learning media. The object of this research is the development of SAC-based interactive multimedia for IPS instruction.

Data collection in this research was conducted through four primary techniques: validation sheets, observations, interviews, and learning outcome tests. Validation sheets were utilized to gather assessments from experts regarding the instructional media that had been developed. These assessments served as a reference for performing media revisions before further testing was implemented. Validation was conducted by four validators who possess competence in relevant fields: a media expert, a material expert, a language expert, and an assessment expert. This was performed to ensure that the developed multimedia has met feasibility standards in terms of content, appearance, linguistics, and evaluation. Observation was implemented as an initial step or preliminary study to identify potential problems existing in the fourth grade of SD Negeri 0401 Pasar Ujung Batu and to obtain an initial overview regarding the implementation of SAC within the classroom learning context.

In addition to observation, the researcher conducted interviews with the fourth-grade teacher to gather more in-depth information on student needs, the curriculum used, available instructional technology, the learning resources commonly used by the teacher, and students' responses to the learning process. Furthermore, to measure the effectiveness of the developed instructional media, the researcher utilized learning outcome tests consisting of a pretest and a posttest. This test consists of a series of questions designed to assess student knowledge and understanding before and after utilizing SAC-based interactive multimedia. The pretest and posttest results are used to determine the extent of improvement in student learning outcomes following instruction using the specified media. Combining the results of feasibility, practicality, and effectiveness analyses provides a comprehensive overview of the quality of instructional multimedia. While the formulas for feasibility and practicality indicate the extent to which a product meets established standards, the effectiveness formula demonstrates the practical impact of the product on the improvement of learning outcomes.

RESULTS AND DISCUSSION

Define

The fourth grade at SD Negeri 0401 Pasar Ujung Batu consists of 24 students, with a composition of 14 male students and 10 female students. The fourth-grade teacher stated that the school has implemented the Kurikulum Merdeka in its instructional activities. Although the curriculum emphasizes a student-centered approach, the instructional process is not yet fully optimal. The teacher reported that frequently encountered challenges include the low level of student understanding regarding the material and limitations in the utilization of instructional media. A significant portion of the instruction remains conventional and focuses on lectures as well as textbooks.

The teacher revealed that although various instructional methods and models have been implemented, they remain insufficiently diverse. The models frequently used include lectures, question-and-answer sessions, and small-group discussions. These methods are considered inadequate for accommodating the diverse learning styles of the students. It was observed that fourth-grade students experience difficulties in comprehending the material, particularly within the Social IPS component. Based on observation results, the learning atmosphere appears monotonous, and student interest in learning has declined.

The instructional media utilized by the teacher primarily consist of visual aids such as images and videos. However, the application of these resources remains inconsistent across learning sessions. Although facilities such as LCD projectors and speakers are available, their utilization is perceived as suboptimal. The teacher acknowledged that the instructional media employed are not entirely self-authored. Furthermore, there is a distinct absence of interactive media systematically designed in accordance with specific learning objectives.

The teacher stated that the learning outcomes of the fourth-grade students, particularly in the IPS subject, are categorized as low. This is reflected in the midterm examination scores, which fall below the Minimum Mastery Criteria (KKM). The lack of variety in instructional strategies and the media utilized represents a primary factor influencing these results. Several students expressed a greater interest in instruction that incorporates engaging visual media. However, technology-based interactive media has not yet been optimally utilized within the learning process.

The teacher confirmed that Information and Communication Technology (Teknologi Informasi dan Komunikasi/TIK) based learning media is not frequently utilized. In fact, the application of ICT, such as educational applications or software, could support student comprehension of the subject matter. The primary constraint encountered is the limitation in effectively integrating technology into instruction. Furthermore, the teacher expressed a lack of confidence in designing digital media that aligns with student characteristics. Consequently, the instructional process has not yet succeeded in providing meaningful and contextual learning experiences.

The application of Smart Apps Creator (SAC) as an interactive media is regarded as a strategic solution to address the aforementioned instructional challenges. This platform facilitates the presentation of material through the integrated utilization of visual, audio, and textual elements. The content structured within SAC is specifically designed to enhance students' comprehension of social conditions and local history. Materials such as regional maps, territorial origins, and local historical figures are presented engagingly and contextually. The ultimate objective is for students not only to memorize information but also to possess the capability to relate such data to their immediate environment.

The formulation of learning objectives is aligned with the principles of the Kurikulum Merdeka, specifically regarding differentiated instruction and character development. These objectives are designed to enable students to identify their residential locations on a map, explain the history of their region, and emulate the values of local figures. Interactive media based on SAC is expected to facilitate independent student

exploration of this material. The presentation of engaging multimedia content also enhances active student engagement. Consequently, the instructional process becomes more meaningful and relevant.

The evaluation instruments developed encompass cognitive, affective, and psychomotor domains. The evaluative formats consist of multiple-choice questions, essays, and projects based on the comprehension of local subject matter. Furthermore, the teacher conducts observations of student activities throughout the instructional process. Student participation in discussions, enthusiasm in exploring the media, and the ability to articulate opinions are assessed as indicators of success. Formative evaluation is conducted during the learning process, whereas summative evaluation is conducted to assess the achievement of learning outcomes following the use of interactive media.

Design

Content design within the interactive instructional media is conducted by referencing the IPAS learning achievements as stipulated in the Kurikulum Merdeka. The developed content consists of media usage instructions, learning achievements, learning objectives, triggering questions, core material, quizzes, puzzle games, and the developer profile. Each component is systematically organized to establish a cohesive and directed instructional flow. Triggering questions are utilized to cultivate student curiosity prior to engaging with the primary material. The content formulation employs communicative language tailored to the cognitive development level of fourth-grade students.

Instructional materials are designed to align with local contexts and IPAS learning objectives, such as regional history and local figures. Visual content and narratives are adjusted to be relevant and captivating for students, particularly within the quiz and puzzle game sections. The media also embeds character values through local figures to enable students to emulate positive attitudes. Material presentation is crafted to be concise yet information-dense to maintain student focus and instructional effectiveness. The content design process involves an analysis of student needs based on initial observation results and feedback from the classroom teacher.

The multimedia design in this instructional media utilizes a combination of visual elements, audio, text, and interactivity (see **Figure 1**). The selection of colors, fonts, and icons is designed to be child-friendly and capable of attracting the attention of elementary school students (SD), featuring a dominance of bright colors and a clean layout. Visual elements in the form of supporting images and illustrations are utilized to clarify the material and enhance the visual comprehension of students. The media also incorporates light animation on buttons, transitions between pages, and interactive elements such as games puzzle that stimulate the active engagement of students. Supporting audio, such as light background music and narration, is utilized to improve learning comfort and clarify information.

Figure 1. Visual Design and Interactive Features in Instructional Multimedia
Source: Author Documentation 2025

In this multimedia design, user-friendly principles are prioritized to enable students to access and operate the media independently. The navigation design is crafted to be intuitive with clear buttons such as "Mulai," "Kembali," and "Cek Jawaban" to support a logical instructional flow. In the quiz and puzzle sections, automatic feedback features are added to ensure students immediately identify correct or incorrect answers. The development of this multimedia considers the balance between an attractive appearance and alignment with learning objectives. The resulting design was tested on a small scale to observe readability, user response, and interaction effectiveness.

Figure 2. Initial Slide of Instructional Media
Source: Author Documentation 2025

Figure 2 illustrates the initial slide of the instructional media. This interactive instructional media was developed in a digital format based on the SAC application, which can be accessed via a link. This format allows the media to be executed on various devices such as laptops, tablets, and smartphones without the need for specialized installation. The selection of the link format was considered to facilitate distribution and support the flexibility of access both at school and at home. The link can be shared through learning platforms or teacher-student communication groups so that it is more practical for use in hybrid or online learning conditions. Furthermore, this format allows the developer to conduct revisions or updates to the content without the requirement of redownloading the application.

Content in this link format is also optimized to incorporate interactive elements such as video, audio, digital quizzes, and games, all of which are integrated within a single application. Each element in the media features internal links that allow users to navigate between menus with ease. Responsive design is also a primary consideration to ensure that the media display remains comfortable to view even when accessed through devices with varying screen sizes. With this format, teachers can access the media at any time as a teaching aid, and students can use it meia for independent study. The selection of a link-based digital format demonstrates that this media is adaptive toward current developments in educational technology.

Develop

The development of SAC-based interactive instructional media was conducted after the completion of the needs analysis and design processes. The creation of the media commenced with the determination of fourth-grade IPAS material in accordance with the learning objectives established within the Kurikulum Merdeka. The selected material focuses on themes related to the local residential area, local history, and the value of kebhinekaan, adapted to students' competencies. The material content was subsequently designed in the form of interactive slides, incorporating images, audio, animations, and supporting videos to facilitate a more profound understanding of concepts among students. This media was structured based on user-friendly principles and engaging visuals to foster active student engagement.

The creation of the media was executed using the SAC application because this platform supports the development of interactive and flexible instructional applications. The media is equipped with navigation features in the form of interactive buttons such as "next," "back," and a quiz menu that responds to student answers directly. Within a single application, practice questions, instructional reflections, and thematic instructional videos are included to complement the material. Each page layout is organized by considering design consistency, color schemes, and text readability to support user comfort. By utilizing SAC, the developed media can be accessed via computer and Android devices, rendering it flexible for use both inside and outside the classroom.

The interface design within the SAC media was developed following instructional design principles, such as the utilization of infographics, visualizations of local figures, and audio narratives to facilitate comprehension. Illustrations of maps, historical artifacts, and animations comparing regional conditions are presented visually to ensure they are more easily internalized by students. All material is organized in a logical sequence beginning with a regional introduction, proceeding through local history, and concluding with the importance of preserving cultural heritage. The content is directly linked to the daily lives of the students to ensure that learning becomes contextual and meaningful. The interface is organized using bright colors and simple icons familiar to elementary school-aged children.

Table 1. Feasibility Assessment Results by Experts

No.	Assessed Aspect	Mean	Category
1.	Media Expert	4,37	Very Feasible
2.	Content Expert	3,33	Feasible
3.	Linguist Expert	4,70	Very Feasible
4	Assessment Expert	3,64	Feasible

Source: Research 2025

The instructional media that had been developed were subsequently consulted with experts to validate their feasibility. The validation was conducted by four experts: a media expert, a content expert, a linguist, and an assessment expert. The results of the expert evaluations are presented in **Table 1**. The media expert provided an average score of 4,37, which falls into the "very feasible" category. The evaluation from the content expert yielded a score of 3,33, classified as "feasible." Meanwhile, the linguist provided a score of 4.7, categorized as "very feasible," and the assessment expert gave a score of 3,64, categorized as "feasible." These results indicate that the media meet the feasibility standards regarding content, interface, language, and evaluation.

An initial pilot test was conducted with five fourth-grade students individually to observe the practicality of utilizing the SAC-based interactive instructional media. These five students were randomly selected based on diverse academic abilities to ensure that the trial results reflected a range of user characteristics. The students were provided with the opportunity to use the media independently and were directed to complete all the materials and exercises available within the application. During usage, the researcher observed the engagement, enthusiasm, and difficulties experienced by the students. Subsequently, the students were requested to complete a practicality questionnaire to provide feedback regarding the instructional media utilized.

Table 2. Results of Student Feedback on the Practicality of Instructional Media

No.	Assessed Aspect	Student Feedback
1.	Ease of Use	The media is easy to use without teacher assistance
2.	Media Interface	The interface is engaging with preferred color schemes
3.	Navigation	Navigation is clear and easily understood
4.	Images, Videos, and Interactive Questions Features	Students appreciate the images, videos, and questions that are challenging yet enjoyable
5.	Material Comprehension	The material is easier to comprehend compared to merely reading textbooks
6.	Average Practicality Level	75.2% (category: highly practical)

Source: Research 2025

The feedback results from the five students presented in **Table 2** indicate a practicality level of 75.2%, which is classified within the "highly practical" category. The students stated that the media is easy to utilize, the interface is attractive, and the navigation is easily understood. Furthermore, they expressed an appreciation for the inclusion of images, videos, and interactive questions that are both challenging and enjoyable. The students admitted that it was easier to comprehend the material with the assistance of interactive media compared to merely reading textbooks. This demonstrates that SAC-based interactive instructional media can enhance student learning motivation.

Table 3. Results of Teacher Feedback on the Practicality of Instructional Media

No.	Assessed Aspect	Teacher Feedback
1.	Ease of Use	The media is easily utilized and accessed without technical difficulties
2.	Alignment with IPAS Content	The media is highly beneficial in elucidating IPAS concepts
3.	Teacher Response	The media encourages active participation and engagement among students
4.	Flexibility of Use	The media is adaptable for various instructional models, including face-to-face or independent learning
5.	Learning Effectiveness	The media is assessed as effective in facilitating the achievement of learning objectives
6.	Average Practicality Level	73.33% (Category: Highly Practical)

Source: Research 2025

In addition to the students, a practical test was also conducted with two kelas IV teachers involved in the IPAS instructional process. The teachers were provided with sufficient time to thoroughly explore and utilize the SAC instructional media. The feedback results presented in **Table 3** indicate that the instructional media achieved a practicality score of 73.33%, which is classified within the "highly practical" category. The teachers stated that this media is significantly helpful in explaining the material and encouraging students to engage in active learning. This media was also assessed as flexible for use within the instructional environment.

From the initial pilot results, it was discovered that students required minimal initial guidance to comprehend the functions of the navigation buttons, yet overall they were capable of utilizing the media independently. The teachers also suggested adding clearer usage instructions on the application's first page to streamline media use. Furthermore, the teachers appreciated the interactive evaluation features because they allow for the immediate identification of student achievement. Based on these initial pilot

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results, the researcher implemented minor refinements to the interface and navigation of the media before proceeding to the field testing phase. This was conducted to ensure that the media is fully prepared for implementation on a broader scale.

Subsequently, an empirical test was conducted on the evaluation questions organized within this instructional media, involving 25 students from another school. The selection of students from outside SD Negeri 0401 Pasar Ujung Batu aimed to avoid instrument result bias, maintain the confidentiality of the evaluation materials before their utilization on the main research subjects, and ensure the validity of the questions within a context comparable to the characteristics of kelas IV students at the research school. All question items utilized in this study proved to be valid, which signifies that they were capable of measuring what they were intended to measure. All question items utilized in this study proved to be valid, which signifies that they were capable of measuring what they were intended to measure.

Table 4. Empirical Test Results of Evaluation Instruments

No.	Type of Test	Results
1.	Item Validity	All test items are valid (capable of measuring the intended constructs)
2.	Reliability	0.822 (category: very high)
3.	Item Difficulty Level	4 difficult items, 5 easy items, and 16 moderate items
4.	Distribution of Item Difficulty	Distributed evenly and balanced
5.	Total Respondents	25 students from another school

Source: Research 2025

The results of the empirical test can be viewed in their entirety in **Table 4**. The reliability test results show a value of 0,822, which is classified as very high. This indicates that the instrument possesses strong consistency in measurement. The test for question difficulty levels indicates that there are 4 items classified as difficult, 5 items classified as easy, and 16 items classified as moderate. With this distribution, the questions are considered balanced and appropriate for measuring the overall ability of the participants.

The results of the instrument reliability test were calculated using the Alpha Cronbach formula as follows:

$$r11 = \frac{k}{k-1}\left(1 - \frac{\sigma_b^2}{\sigma_t^2}\right)$$

Based on the calculation results, a reliability value of 0.822 was obtained, which is included in the very high category, the instrument is declared to possess strong measurement consistency. The test for the level of question difficulty was conducted using the formula $P = \frac{B}{N}$, where B represents the number of participants who answered correctly and N represents the total number of test participants. Based on the analysis results, there are 4 items classified as difficult, 5 items classified as easy, and 16 items classified as moderate. With this distribution, the questions are assessed as balanced and feasible for measuring the overall ability of the participants.

Based on the item discrimination test results, 5 questions were classified as good and 20 as very good. This indicates that the majority of the questions are capable of effectively distinguishing between high-ability and low-ability participants. Strong discriminatory power is essential to ensure accurate and fair measurement results. Consequently, the question instrument utilized has met the quality standards for instructional evaluation. Overall, the analysis results demonstrate that the questions utilized are feasible and effective for use in the research.

Disseminate

The field trial was conducted in kelas IV at SDN 0401 Pasar Ujung Batu with a total of 24 students. The SAC-based interactive instructional media was implemented in the Natural and Social Science (IPAS) learning process covering the topic of regional identification and its history. During the execution, the teacher utilized the SAC media in the form of an interactive application containing material, images, animations, and practice questions. Learning activities were conducted face-to-face with the assistance of an LCD projector and speakers as media support. All students were actively involved and demonstrated enthusiasm while participating in the learning process using this interactive media.
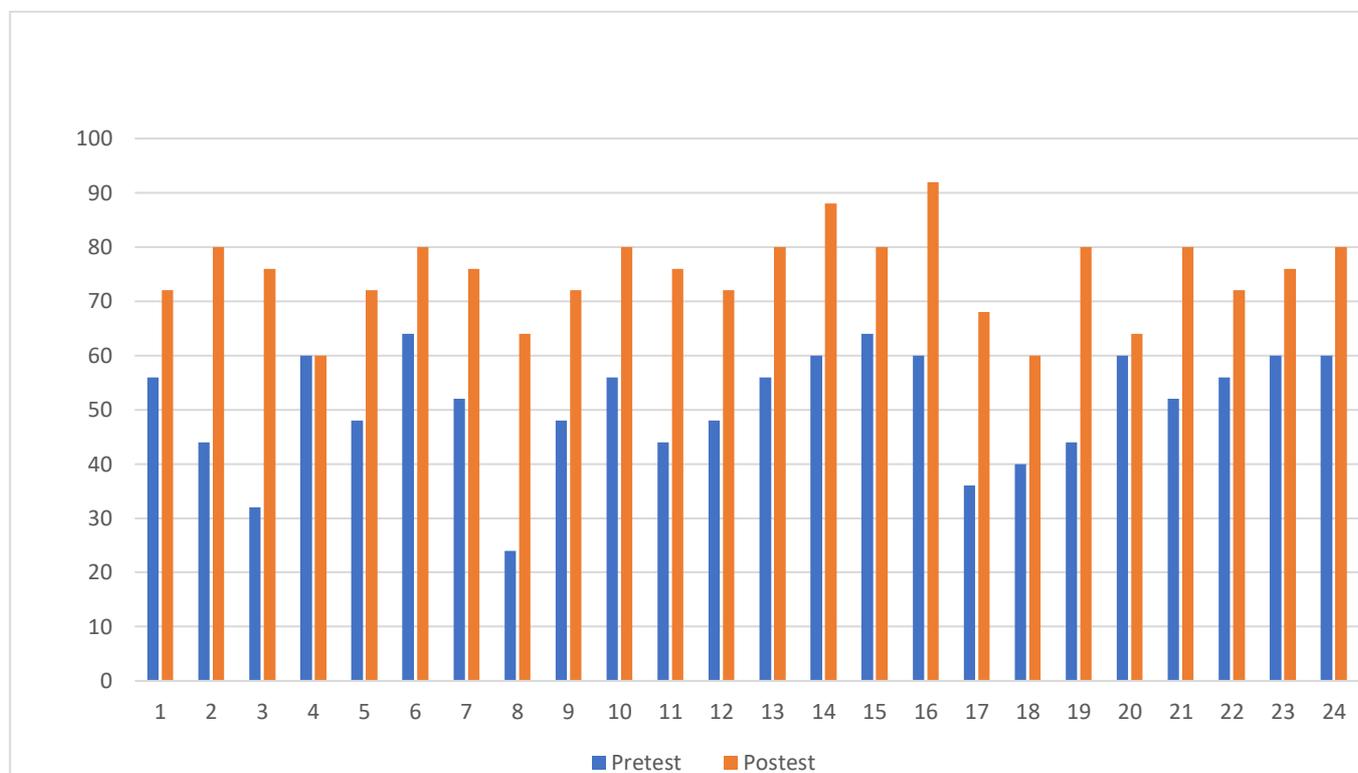
Figure 3. Pretest and Posttest Graphs
Source: Author's Documentation 2025

Assessment of learning outcomes was conducted through a pretest and a posttest to observe the increase in students' cognitive understanding following the utilization of the instructional media (see **Figure 3**). The average pretest score of the students was 51, which indicates that the students' initial understanding of the Natural and Social Science (IPAS) material was still low. The displayed graph illustrates a comparison between the average pretest and posttest scores, where a significant increase occurred in the posttest scores after the implementation of the SAC-based interactive media. After instructional implementation using SAC media, the average posttest score increased to 75. This indicates a significant improvement in learning outcomes following the utilization of interactive media. This score enhancement is supported by the results of the effectiveness test utilizing the N-Gain formula, which yielded a value of 0,49, classified within the medium category.

In addition to the cognitive aspect, the psychomotor aspect of the students was also observed during the instructional process. The students demonstrated creativity by utilizing media and technology to extract information, such as exploring the features within the SAC application. Regarding the aspects of problem-solving and independence, the students actively sought solutions when encountering difficulties in comprehending the material or while completing questions within the media. Such an attitude indicates that interactive media is capable of encouraging students to be more independent and to think critically.

This psychomotor observation demonstrates that SAC media supports the development of 21st-century learning skills in students.

Affective assessment was also conducted to observe student attitudes during the instructional process. The students appeared more confident in expressing their opinions and posing questions to the teacher. They also demonstrated discipline and responsibility in completing the tasks assigned through the instructional media. Student independence increased as they became accustomed to exploring the material autonomously through the application. This indicates that interactive media not only enhances cognitive aspects but also fosters positive student character.

Overall, the field trial demonstrates that the SAC-based interactive instructional media is effective in improving the Natural and Social Science (IPAS) learning outcomes of the students. Within the cognitive, psychomotor, and affective domains, the students experienced significant improvement. Furthermore, the teachers felt assisted because this media can facilitate the delivery of material and create a more vibrant classroom atmosphere. The field trial provides a strong foundation for the feasibility of implementing this media on a broader scale. Consequently, a process of revision and refinement was conducted prior to the final dissemination.

Discussion

Expert validation results indicate that the SAC media meet feasibility standards across various aspects, including content, interface, language, and evaluation. These findings indicate that instructional design, which considers student needs and pedagogical principles, can produce effective media. This is consistent with research emphasizing the importance of developing media based on an analysis of student needs (Zamil & Udyaningsih, 2021). The systematic development approach, starting from the analysis, design, development, and validation stages through to revision, ensures that the resulting media is not only feasible for use but also contextual and well-targeted. This finding is consistent with the 4D development model proposed by Thiagarajan et al. in 1974 in the book titled "Instructional Development for Training Teachers of Exceptional Children," which emphasizes the importance of designing media according to multimedia learning principles to be valid and effective for classroom use. This view is also reinforced by research highlighting that the validation of content, language, and interface aspects constitutes a critical stage in instructional design to guarantee alignment with learning objectives (Spatioti *et al*., 2022).

The results of the empirical test on the evaluation questions demonstrate that all question items are valid and reliable, with a reliability value of 0,822, which is classified within the very high category. Instrument validity ensures that the questions are capable of measuring relevant learning achievements, while reliability indicates the consistency of the measurement results. An evaluation instrument designed with systematic principles will produce an assessment that is objective and representative of the learning objectives (Reigeluth & Honebein, 2020). Furthermore, the balanced distribution of difficulty levels (difficult, moderate, and easy) and strong discriminative power reinforce the evaluation's function as a tool for measuring students' critical thinking abilities. A high-quality question must be capable of proportionally distinguishing the levels of student mastery regarding the material (Valdez *et al*., 2022).

In terms of practicality, the SAC media received positive responses from both students and teachers. Students felt more motivated because the media is easy to use, features an attractive interface, and is enjoyable to study with. The presence of interactive features such as quizzes and puzzles ensures that the instructional process remains engaging. Multimedia-based interactive media can enhance the motivation, interest, and instructional effectiveness of elementary school students (Rosyiddin *et al*., 2023). From the teachers' perspective, the media was assessed as helpful in facilitating active learning, flexible in its application, and relevant to the characteristics of the students. The utilization of digital instructional media can enhance student participation and clarify the delivery of material (Conesa *et al*., 2020; Xie &

Correia, 2024). The success of digital media is determined by the level of usability and user satisfaction (Alqahtani & Rajkhan, 2020). Thus, the SAC media in this study have been shown to be practical by both teachers and students, aligning with global research trends.

The SAC media also fosters exploratory learning, where students actively investigate material, resolve challenges, and discover information autonomously. This approach reflects the principles of constructivism, which posit that meaningful learning occurs when students are directly involved in the construction of their own knowledge (Kim *et al*., 2022). The inclusion of multimedia elements such as images, audio, animation, and interactivity establishes this media as an effective multimodal learning tool. Multimedia instruction is effective because it integrates visual and verbal channels within the cognitive processes of the students (Khasanah *et al*., 2020; Rajagukguk *et al*., 2025). The importance of a constructivist-based learning environment in supporting exploration and problem-solving indicates that discovery-based learning fosters the development of critical thinking skills and deeper conceptual understanding (Sasson *et al*., 2022). The inclusion of multimedia elements such as images, audio, animation, and interactivity further reinforces the effectiveness of the media (Baharuddin *et al*., 2024; Hwang *et al*., 2020). Therefore, the SAC-based interactive multimedia instructional media is not only feasible and practical but also capable of establishing a participatory, meaningful, and enjoyable learning environment. This media has the potential to serve as an instructional alternative that supports the comprehensive achievement of student competencies.

However, this study possesses several limitations. First, the measurement of media effectiveness focuses solely on the cognitive domain, thereby failing to comprehensively represent the impact on students' affective and psychomotor aspects. Second, the utilization of this media requires adequate technological infrastructure support, such that its implementation in schools with limited facilities may encounter obstacles. These limitations inform future research that involves more diverse samples, measures multiple domains of ability, and adapts the media to different infrastructure conditions. Limited technological access remains a primary challenge in implementing digital learning, particularly in developing countries (Fajarwati *et al*., 2022; Papcunová *et al*., 2023; Sumual *et al*., 2023). Therefore, subsequent research should involve more diverse samples, measure affective and psychomotor domains, and adapt the media to ensure continued effectiveness even under conditions of limited infrastructure.

CONCLUSION

This research indicates that the development of SAC-based interactive instructional media for Science and Social Studies (IPAS) in primary schools fulfills the criteria of feasibility, practicality, and effectiveness. Validation from experts proves that this media is feasible for use in terms of content, interface design, linguistic aspects, and evaluation. This media is also assessed as highly practical by students and teachers, while successfully enhancing student understanding and learning motivation. Overall, the media development was conducted systematically and based on instructional needs, thereby producing a product that not only supports the delivery of material but also facilitates exploratory, interactive, and enjoyable learning activities. This reinforces the conclusion that SAC-based interactive media can serve as an innovative alternative in Natural and Social Science (IPAS) instruction oriented toward strengthening student learning outcomes.

Although the research results indicate that the SAC-based instructional media are feasible, practical, and effective in improving student learning outcomes, there are several aspects that could be enhanced. Regarding media content, the material could be enriched with a variety of interactive activities and difficulty-level adjustments to align with students' diverse abilities. In terms of the research approach, the effectiveness testing remains limited to the cognitive domain and the scope of a single school; consequently, measuring the impact on affective and psychomotor aspects, alongside trials across various

schools with differing infrastructure conditions, would provide a more comprehensive overview. Furthermore, the results of this research must be generalized with caution because student characteristics, learning cultures, and technology availability in other schools may vary. Future research involving larger and more diverse samples is expected to strengthen these findings and expand the potential for the national application of this media.

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