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Enhancing Javanese Script Literacy Through SIDORAWA Multimedia: A Case Study at an Islamic Elementary School

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ABSTRACT

Literacy in reading and writing Javanese script among elementary school students remains low, primarily due to unengaging learning media and limited student motivation. To address this issue, this study explores the implementation of SIDORAWA (Sinau Karo Dolanan Aksara Jawa), an interactive multimedia application designed to enhance Javanese script literacy. A qualitative case study was conducted at Aisyiyah Surya Ceria Islamic Elementary School involving 28 fourth-grade students. Data were collected through interviews, classroom observations, and documentation. The Miles and Huberman interactive model was used for data analysis, and data validity was ensured through triangulation of techniques and sources. Findings indicate that SIDORAWA effectively improved students' ability to read and write Javanese script. The application integrates visual, auditory, and interactive elements—including animations, sound, and culturally nuanced games—that enhance engagement and comprehension. Students showed increased motivation, active participation, and improved literacy outcomes, with reading and writing proficiency rising significantly after implementation. SIDORAWA not only supports academic literacy but also fosters digital and cultural literacy by embedding local cultural elements into the learning process. Although the study demonstrates positive outcomes, its scope is limited to a single class and school. Broader implementation across different contexts and integration into blended learning environments is recommended. Additionally, ongoing support through teacher training, infrastructure, and feature development is essential for maximizing its educational impact.

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1. INTRODUCTION

Reading and writing literacy are the main foundations in early childhood education because both complement each other in building communication and critical thinking skills (Batanero et al., 2021). Learning to write and read must be done gradually and continuously, starting from the introduction of

letters, words, to forming meaningful sentences (Laila et al., 2021; Ratnaningsih & Clara, 2021). To achieve high literacy, children need to be accustomed to reading various texts and writing actively, because these skills are important in academics and daily life as the main communication tool (Castillo-Cuesta et al., 2022; Çizmeci & Çiprut, 2018). In a cultural context, learning Javanese script in elementary schools has an important role not only in linguistic aspects, but also in preserving cultural and historical values contained in Javanese script texts (Suria, 2018; Panagiotidis et al., 2023). The hope is that the younger generation will not only have good literacy skills from an early age, but also the awareness to maintain and preserve their cultural heritage.

However, in reality, Javanese script writing and reading skills in elementary schools are still low due to the lack of integration of Javanese script in the curriculum and the dominance of Latin-based digital media (Kusuma et al., 2019; Widya & Mustagfirin, 2020; Cahyani & Subrata, 2022)Suria, 2018; Panagiotidis et al., 2023). In addition, inadequate supporting facilities and the lack of creative technology-based learning media are also inhibiting factors (Astuti, 2018; Estianti & Al Masjid, 2021). Learning Javanese script has unique characteristics that require a more contextual approach, but conventional methods that rely on textbooks and static images are often not enough to help students understand the script (Prasetyo et al., 2023; Walidah, 2024). Seeing these challenges, innovation is needed in learning to write and read Javanese script that is more interesting and in accordance with current developments.

Technology-based approaches are an alternative to overcome challenges in learning the Javanese script in the digital era. Technology-based approaches are an alternative to overcome challenges in learning the Javanese script in the digital era. The use of interactive multimedia, which combines visual elements, audio, video, and interactive features, has been proven to significantly increase student motivation, reading and writing literacy, and learning outcomes (Fitriani et al., 2022; Makransky et al., 2020). In an effort to preserve digital-based Javanese script in elementary school environments, the active role of teachers, schools, and the government is essential so that learning remains relevant and sustainable (Ilham & Rochmawati, 2020). One innovation that can be applied to improve Javanese script writing and reading skills is the use of technology-based learning media such as SIDORAWA (Sinau Karo Dolanan Aksara Jawa). This media integrates visual, audio, and interactive elements that make learning Javanese script more interesting and effective. With this technology, students can learn to recognize, read, and write Javanese script more easily and be more motivated in the learning process.

Seeing these challenges, innovation is needed in learning to write and read Javanese script that is more interesting and in accordance with current developments. A technology-based approach is one effective solution, especially with the use of interactive multimedia. Multimedia-based learning can significantly increase student motivation and learning outcomes (Fitriani et al., 2022; Makransky et al., 2020). The involvement of teachers, schools, and the government is essential to ensure that Javanese script remains part of the basic education curriculum and continues to be preserved by the younger generation (Ilham & Rochmawati, 2020). One innovation that can be applied to improve Javanese script writing and reading skills is the use of technology-based learning media such as SIDORAWA (Sinau Karo Dolanan Aksara Jawa). This media integrates visual, audio, and interactive elements that make learning Javanese script more interesting and effective. With this technology, students can learn to recognize, read, and write Javanese script more easily and be more motivated in the learning process.

Several studies have examined the implementation of multimedia in Javanese script learning to improve literacy, especially Javanese script writing and reading skills. Fitriani et al. (2022) found that the Make a Match model assisted by multimedia can improve Javanese script reading skills in fourth-grade students of SDN 02 Karangsari. Kusuma et al. (2019) state that the implementation of Android-based Augmented Reality (AR) technology can help third-grade students of SDN Sidorejo increase their

motivation to learn and understand Javanese script forms more easily. Widya & Mustagfirin (2020) created a 3D educational game with an accelerometer that makes learning more interesting and effective at SDN Pedalangan 03 Semarang. Suria (2018) developed a word game algorithm to accelerate the process of learning Javanese script digitally, but did not specifically mention the school level that was the focus of the study. Arif (2022) designed the Hanacaraka Sudoku puzzle using the design thinking and game design methods as an interactive learning media that can increase interest in learning Javanese script and is a positive alternative to using smartphones because it has the benefit of developing cognitive and affective aspects for elementary and middle school students.

Previous studies have shown that the use of multimedia technology, game-based learning, and AR has been proven to increase student engagement in learning Javanese script, especially with a multimedia-based approach and interactive games. Despite existing research on multimedia-based Javanese script learning, little attention has been given to culturally integrated approaches, particularly in Islamic elementary schools. This study addresses this gap by introducing SIDORAWA (Sinau Karo Dolanan Aksara Jawa) as an innovative solution that is not only technology-based but also combines gamification elements, direct feedback, and a multisensory approach to make learning more interesting and effective. SIDORAWA is designed to improve Javanese script writing and reading skills with a more interactive, adaptive approach that suits students' learning styles, especially in Islamic elementary schools environments. By integrating local cultural values into its content, SIDORAWA not only strengthens digital literacy but also cultural literacy, so that learning becomes more meaningful. This study aims to analyze the implementation of SIDORAWA multimedia in improving literacy, namely writing and reading skills of the Javanese script in fourth-grade students at an Islamic elementary school.

2. METHODS

Qualitative methods were used in this study to gain an in-depth understanding of the implementation of SIDORAWA multimedia (Sinau Karo Dolanan Aksara Jawa) in learning Javanese script writing and reading skills in Islamic elementary schools. In accordance with Sutama (2019) qualitative research is descriptive in nature, allowing for a detailed and in-depth description of the phenomenon being studied in its original context. The research design used was a case study, which allows for an in-depth analysis of the implementation of SIDORAWA multimedia in a real learning environment.

This research was conducted at Aisyiyah Surya Ceria Islamic elementary school, a school that not only teaches students to be intellectually intelligent but also has a commitment to forming good character and supporting the preservation of local culture, especially Javanese script. In addition, this school supports learning innovation and has implemented several technologies in the educational process to support more interesting and effective learning. The subjects of the study were 28 fourth-grade students, consisting of 12 boys and 16 girls. The selection of these fourth-grade students was based on the consideration that they had mastered the basics of learning Javanese script at a level sufficient to apply the SIDORAWA multimedia-based learning. In addition, the fourth grade is at a cognitive development phase appropriate for introducing more complex interactive learning technologies compared to lower grades.

Data collection was conducted through observation, interviews, and documentation. Observations were conducted to directly see the ongoing learning process, while interviews were conducted with teachers and students to gain further understanding of the implementation of SIDORAWA multimedia. Documentation includes student learning outcomes, teacher notes, and recordings of learning

activities. The validity of the data was tested using technical triangulation and source triangulation, which aimed to ensure the credibility and reliability of the data obtained. Technical triangulation was conducted by comparing the results of observations, interviews, and documentation, while source triangulation was conducted by matching information from various informants, including students and teachers.

The data analysis technique used the Miles and Huberman interactive model; according to Miles et al. (2014), the qualitative data collected were analyzed through three main stages: data reduction, data presentation, and verification/conclusion. At the data reduction stage, irrelevant information was filtered and simplified to focus on aspects directly related to the implementation of SIDORAWA. Then, at the data presentation stage, the results of observations, interviews, and documentation were presented in an easy-to-understand narrative form to facilitate further analysis. At the verification/conclusion stage, the data that has been presented is tested and validated to draw valid conclusions regarding the impact of using SIDORAWA on Javanese script writing and reading skills in fourth-grade students.

3. FINDINGS AND DISCUSSION

Integration of technology in learning Javanese script is one of the innovations that can improve literacy, namely the skills of reading and writing Javanese script. One form of this innovation is the use of SIDORAWA multimedia (Sinau Karo Dolanan Aksara Jawa), an Android-based application designed to help students learn Javanese script more interactively and enjoyably. Based on an interview with MSA, the developer of the SIDORAWA application, it was explained that this application was developed using Adobe Flash CS6 with Air for Android. She said that the selection of this platform allows the development of interactive learning media that is compatible with various Android devices. She said, *"With this technology, we can integrate animation, sound, and gamification elements to make learning more interesting. The hope is that students will not only read and write Javanese script but also be more motivated to learn through a fun experience"* (Interview with the application developer, 7/1/2025).

Support for the use of SIDORAWA was also conveyed by the principal; he said that learning Javanese script is often considered difficult by students because the methods used tend to be less interesting. However, with SIDORAWA, students become more enthusiastic in learning because this application offers a more interactive approach. He said, *"Through the implementation of SIDORAWA multimedia, students recognize scripts faster, understand how to read them, and are able to write better compared to conventional learning methods and media"* (Interview with the principal, 20/1/2025). The same thing was also conveyed by a fourth-grade teacher. According to him, the implementation of SIDORAWA multimedia really helps students in literacy in reading and writing Javanese script. She said,*"With this application, learning becomes more interesting and not boring. Students not only see the shape of the script but can also hear the pronunciation and see how to write it correctly through animation"* (Interview with a fourth-grade teacher, 21/1/2025).

Furthermore, the teacher explained that the use of SIDORAWA multimedia was carried out in three stages of learning, namely opening, core, and closing. In the opening stage, the teacher introduced Javanese script using images and sound from the SIDORAWA application. In the core stage, students were invited to practice reading and writing Javanese script with the help of animations and interesting interactive exercises. Then, in the closing stage, the teacher gave a quiz through the application to see how far the students understood the material. This is in accordance with the results of observations that SIDORAWA multimedia, which is integrated with images, sound, and animation, provides a more interesting and interactive learning experience. Students also showed high enthusiasm. The teacher

carried out learning practices in accordance with the teaching module documents that had been created and utilized SIDORAWA as a learning medium to improve Javanese script writing and reading skills in grade four.

3.1 Implementation of SIDORAWA in Opening Learning Activities

In the opening stage, starting with greetings and prayers, the teacher asks for news and checks attendance, after which an apperception is carried out to link previous learning with what is currently being learned. The teacher delivers an introduction about the importance of knowing Javanese script and introduces SIDORAWA multimedia and delivers the main menu in the application, such as Sinau (learning), Gladhen (practice), and Dolanan (games). Displays instructions for using SIDORAWA multimedia, including navigation and main functions. The teacher also conveys the learning achievements that students must master, such as recognizing, reading, and writing Javanese script through the indicator and objective menus. The following is a picture of the main menu, instructions, objectives, and learning indicators:

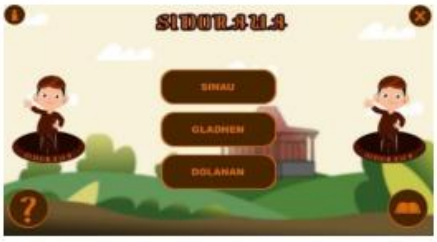

Figure 1. Main Menu

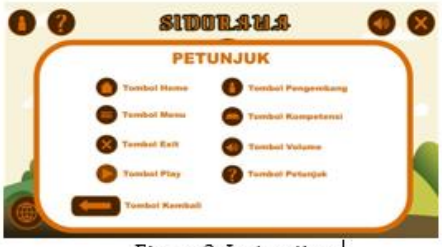

Figure 2. Instructions

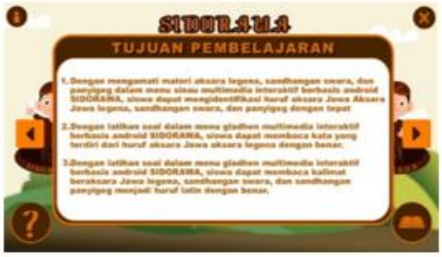

Figure 3. Learning Objectives

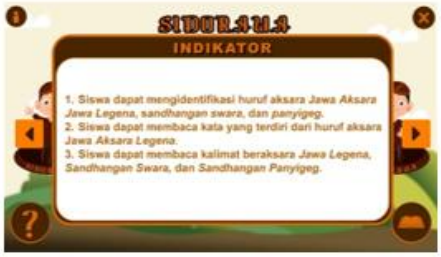

Figure 4. Learning Indicators

SIDORAWA Multimedia is designed to help students learn Javanese script interactively and enjoyably. In the early stages of learning, the teacher introduces the main menus in the application, namely Sinau (Learn), Gladhen (Practice), and Dolanan (Games), as shown in Figure 1 (Main Menu). The Sinau menu provides Javanese script learning materials; Gladhen contains exercises to hone students' understanding, while Dolanan presents educational games that make learning more interesting.

So that students can use the application effectively, the teacher also explains the instructions for use in Figure 2 (Instructions). These instructions include navigation and the functions of various buttons, such as Home, Menu, Exit, and Play, as well as buttons to adjust the volume, display competencies, and view the usage guide. With these instructions, students can understand how to operate the application more easily.

Next, the teacher conveys the learning objectives that students must achieve, as explained in Figure 3 (Learning Objectives). These objectives include students' ability to identify Javanese script letters, read words consisting of Javanese script, and construct Javanese script sentences correctly. This learning

objective provides clear direction for students in learning Javanese script using SIDORAWA. The teacher also explains the learning achievement indicators, as listed in Figure 4 (Learning Indicators). This indicator includes students' ability to identify Javanese script letters, read words composed of Legena script, and read sentences equipped with sandhangan. With this indicator, the teacher can measure the extent of students' understanding of Javanese script and provide appropriate guidance. Through this stage, students are not only introduced to Javanese script theoretically but also gain a more interesting and enjoyable learning experience through SIDORAWA multimedia. With an interactive approach, learning Javanese script becomes more effective, helping students understand and master the material better.

3.2 Implementation of SIDORAWA in Core Learning Activities

At the core stage of learning, the teacher delivers learning materials according to the material or sinau menu; there are four main menus related to the material "Aksara Legena," "Sandhangan Swara," "Sandhangan Panyigeg," and "Tuladha." The teacher provides an explanation of the material regarding the shape of letters and examples of letters in words; students actively interact with the learning materials and directly experience the learning process with the help of interesting and interactive media. As a main part of this learning, SIDORAWA multimedia helps students to understand and practice the skills of writing and reading Javanese script.

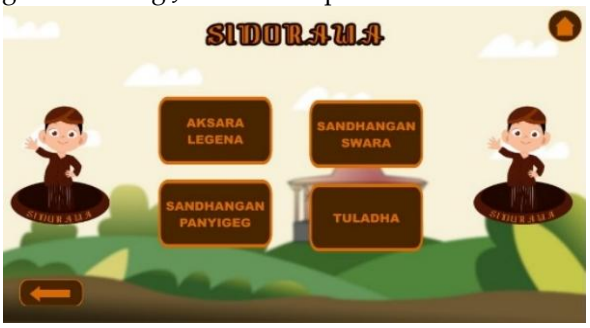

Figure 5. Sinau Menu (Material)

Each menu in this display provides students with access to learn various aspects of Javanese script in more depth. "Aksara Legena" contains material on basic script in Javanese script, while "Sandhangan Swara" discusses diacritical marks used to change the sound of script. "Sandhangan Panyigeg" deals with punctuation in Javanese script, and "Tuladha" likely contains examples or exercises to help students understand the use of the script in a broader context. In addition, on the left and right sides of the screen are animated children who appear to greet users, creating a more interactive and engaging learning atmosphere for students. The background depicts natural scenery and traditional buildings, reinforcing the Javanese cultural elements in this learning medium.

The use of video in SIDORAWA multimedia is not only limited to animated images showing the form of Javanese script but also provides further explanation on how to write the script in the correct order. With the sound pronouncing each letter, students not only see the form of the script but also hear how to pronounce it. This is very important because, in addition to writing skills, correct pronunciation is also part of the skills that students must have in learning Javanese script. Thus, SIDORAWA multimedia facilitates more efficient learning in introducing both aspects, namely visual (writing) and auditory (reading and pronouncing).

After students watch a video introducing how to write Javanese script, they are immediately asked to write the script they have learned on the board or in their books. Although students have watched the video and gained a basic understanding of how to write Javanese script, they still need practical

assistance in order to write correctly and neatly. For example, some students may have difficulty writing certain letters because they are not yet familiar with the more complicated form of Javanese script. Therefore, teacher guidance during this activity is very important to ensure that students do not make repeated mistakes.

Teachers ensure that all students are actively involved in the learning process and involve them in small group activities. These small group activities are designed to increase interaction between students so that they do not only learn individually but also through collaboration with their friends. This collaboration also provides an opportunity for students who are quicker to understand the material to help their friends who are still struggling. This process accelerates the understanding of slower students because they can get additional explanations from friends who are more proficient. In addition, small group activities also build self-confidence in students who are struggling because they feel supported by their friends. For students who may feel shy or afraid to ask questions of the teacher, these small groups provide a more comfortable space to learn and discuss. This helps create a more inclusive learning atmosphere, where every student, both fast and slow, can develop according to their respective abilities.

In addition to the material menu, there is also a Gladen menu or practice questions for writing Javanese script with animation and sound guidance. The Gladen menu, or practice questions, has three main menu options, namely "Gamelan Capture," "Random Box," and "Market Snacks.". Each menu likely offers different types of games or exercises related to Javanese script, so students can choose activities according to their preferences. In addition, on the left and right sides of the screen, there are animated child characters who appear to greet users with cheerful expressions, creating a more interactive and friendly learning atmosphere for students. The background displays natural scenery and traditional buildings, which strengthen the nuances of Javanese culture in this learning media.

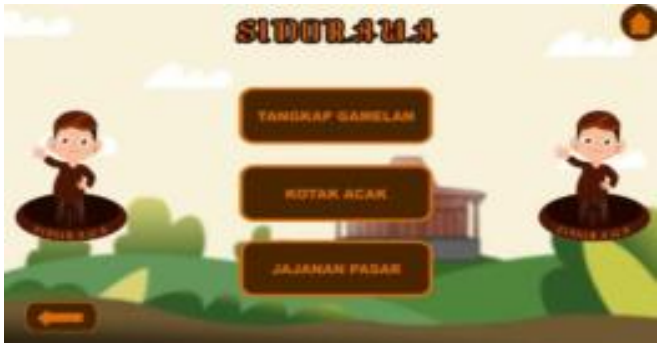

Figure 6. Gladen (Practice Questions)

SIDORAWA multimedia not only provides learning materials, but also provides a direct feedback menu for each exercise done by students. Through sound and animation, students can find out whether they have written Javanese script correctly, which can increase their motivation to continue practising. With a game-based approach and interesting visual interactions, SIDORAWA is an innovative alternative to learning Javanese script that is more effective and enjoyable.

Thus, the core activities in this learning not only involve theoretical learning, but also practical learning that involves direct interaction with the material using SIDORAWA multimedia. Through video, sound, and animation, SIDORAWA multimedia gives students the opportunity to learn in a more interactive and enjoyable way. This indicates that SIDORAWA multimedia not only functions as a visual learning aid, but also as an important source of motivation for students. The feedback provided by multimedia can increase students' self-confidence, especially when they receive recognition for their

efforts and achievements. With direct feedback, students feel appreciated and more motivated to continue learning and practicing harder. Students not only gain knowledge and skills, but also feel motivated and appreciated in their learning process.

3.3 Implementation of SIDORAWA in Closing Learning Activities

In the closing activity, the teacher invites students to make conclusions together and displays a dolanan menu containing interactive games to strengthen students' understanding of Javanese script. The teacher gives a multimedia-based quiz as a tool to evaluate students' understanding.

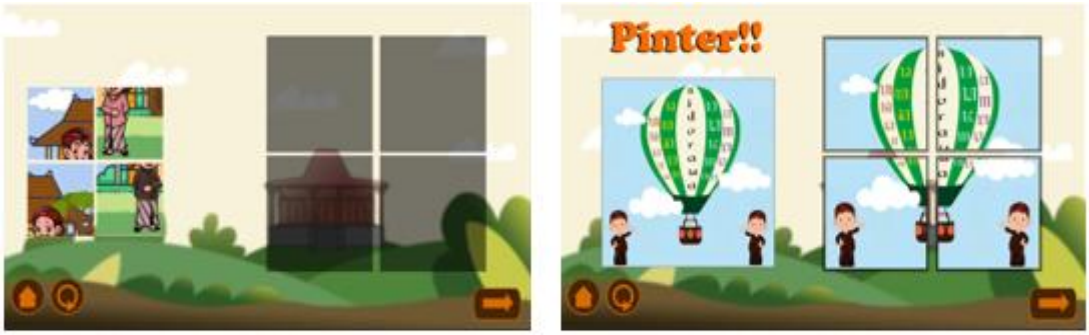

Figure 7. Dolanan

Interactive puzzle-based games are designed to strengthen students' understanding of Javanese script in a more fun and engaging way. In the left picture, you can see the initial stage of the game where students are asked to assemble pieces of an incomplete picture. Each piece of the picture contains visual elements related to Javanese script, such as characters, environments, or Javanese cultural objects. Students must match and place the pieces in the correct positions to form a complete picture..

In the right figure, the display shows that the puzzle has been successfully assembled correctly, marked by the appearance of the words "*Pinter!!*" as a form of appreciation and positive feedback for students. The completed image shows a hot air balloon with Javanese script written on it so that students can read and recognize the shapes of Javanese script better. This game not only helps students learn Javanese script visually and interactively but also improves memory through the activity of putting together puzzles. In addition, this game provides a fun learning experience, increases student motivation, and develops cognitive skills such as problem-solving and hand-eye coordination. Thus, this interactive game-based learning method can be an effective alternative in improving students' understanding of Javanese script, especially for those who have visual and kinesthetic learning styles.

Afterwards, the teacher conducted a learning reflection and asked students to provide feedback. This reflection is a very useful source of information to evaluate the advantages and disadvantages of the learning methods used. By asking students whether they find it easier to learn using SIDORAWA multimedia, teachers can assess the extent to which this multimedia is successful in supporting their understanding. In addition, students are also given the opportunity to provide criticism or suggestions for the media used, which can help teachers improve the quality of teaching and the use of technology in the future. As a follow-up, the teacher gives students homework to deepen their understanding of the Javanese script. Homework not only functions as writing practice but also as a way to reinforce the material that has been learned during the lesson. By watching the video again at home, students are expected to be able to better understand and remember the steps for writing Javanese script that have been taught. Learning activities are closed with greetings and prayers together.

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Overall, the results of observations in class showed that the use of SIDORAWA multimedia provided a more interesting and interactive learning experience for students. With the combination of images, sound, and animation, students looked more enthusiastic and active during the Javanese script learning process. This was also reinforced by various learning documentation, such as teaching journals, photos and videos of learning, observation sheets, and student work results, which showed that the use of SIDORAWA had a positive impact on student involvement and understanding in learning Javanese script.

In the teaching journal, the teacher noted that students seemed more focused and involved in the learning process. They were more motivated to practice writing scripts and enjoy various educational games available in the application. The teacher also used SIDORAWA as the main media by displaying the application on the classroom screen. Interactive features such as animations of writing movements, pronunciation of letters, and direct practice in the application have been proven to help students understand the material more easily than traditional learning methods. Support for this finding is also seen in the documentation of photos and videos of learning, which record how students interact with SIDORAWA, both individually and in groups. In the visual documentation, students appear enthusiastic about trying to practice writing letters using animated guides and participating in various educational games in the application. Several recordings also show their happy expressions when they successfully complete challenges, indicating an increase in their learning motivation.

3.4 The Impact of SIDORAWA Multimedia Implementation

The implementation of interactive multimedia SIDORAWA in Javanese script learning in elementary schools has shown a real contribution to improving literacy, especially Javanese script reading and writing skills. Before using the SIDORAWA application, most students found it difficult to read Javanese script fluently because the previous learning method was still monotonous. After being implemented, students became more enthusiastic because learning was presented interactively, through images, sound, and animation. This is in line with the documentation of student learning outcomes, which shows an increase in Javanese script reading skills, which were previously only around 40% (11 out of 28 students) and increased to 86% (24 out of 28 students), becoming more active and fluent in reading Javanese script.

Furthermore, the teacher explained that after students were accustomed to using SIDORAWA, their skills in writing Javanese script also experienced a real increase. This cannot be separated from the role of digital literacy and culture presented in the application. Through interactive features such as animation of how to write, pronunciation sounds, and clear visualization of script shapes, students not only learn to recognize letters but also understand how to write them correctly. This learning experience that combines technology and local cultural content makes students more engaged and motivated. This can be seen in the learning outcome document, where, before using SIDORAWA, only 46% (13 out of 28 students) were able to write Javanese script correctly. After the application was used consistently, the number increased to 86% (25 out of 28 students). This finding confirms that the integration of digital and cultural literacy is able to strengthen students' reading and writing literacy more comprehensively and meaningfully.

The implementation of interactive multimedia SIDORAWA in learning Javanese script in elementary schools has been proven to provide a more interesting and easy-to-understand learning experience for students. By combining images, sound, and animation, students can learn Javanese script in a more enjoyable way and according to their learning style. In addition to delivering material visually, SIDORAWA also allows students to learn independently or work together in groups through various interactive features available. *"With the SIDORAWA application, students understand how to read and write Javanese script faster. They can see the shape of the letters, hear them, and follow the animation on how to write them, which is clearly more effective than just learning from textbooks"* said a fourth-grade teacher in an interview on January 21, 2025

Support for the use of SIDORAWA was also conveyed by the principal. He explained that so far many students have found it difficult to learn Javanese script because the learning methods are still too conventional and not interesting. With the SIDORAWA application, learning becomes more lively because it combines visual elements, sound, and animation, which makes students more interested and makes it easier to understand the material. In addition to improving Javanese reading and writing skills, this application also strengthens digital and cultural literacy through content that is relevant to local life and culture. *"Students are more enthusiastic about learning Javanese script because the display is attractive and they can learn while playing. This is important so that they can not only read and write but also love their own culture"* said the principal when interviewed on January 20, 2025.

Not only teachers and principals, but students also feel the benefits of using the SIDORAWA application. In an interview conducted on January 21, 2025, they revealed that learning Javanese script has become more fun and not boring. Student A said that previously he had difficulty writing Javanese script because he did not know the order of the strokes. However, after using SIDORAWA, he felt more helped because there was an animation that showed how to write each character clearly. Student B preferred to learn while playing, admitting that he was more enthusiastic about learning because the application contained games such as puzzles that made learning feel like playing. Meanwhile, student C felt helped by the sound feature because he could hear how each character was pronounced, so it was easier for him to distinguish similar shapes. Student D, who enjoyed learning with visual displays, also liked the colorful display and animations in the application, making him more interested in learning. The experiences of these students show that SIDORAWA is able to make learning Javanese script more interesting and in accordance with the learning needs of each student.

The results of this study indicate that the use of SIDORAWA multimedia is significantly able to improve Javanese literacy, especially reading and writing skills, in fourth-grade students of an Islamic elementary school. Students' reading skills increased from 40% to 86%, and writing skills from 46% to 89%. Relevant to the findings of Fitriani et al. (2020) which prove that the use of interactive multimedia can improve literacy, especially Javanese script reading skills in fourth grade elementary school students, marked by the achievement of cycle 1 of 66.66% increasing to 79.16% in cycle 2 and increasing again to 85.41% in cycle 3. However, there are differences in terms of focus and approach. The previous study was classroom action research that only emphasized improving Javanese script reading skills using the Make a Match cooperative learning model and simple media such as question cards and live worksheets in public elementary schools. While the current study is a qualitative study examining the application of Android-based SIDORAWA interactive multimedia, which not only trains reading skills but also Javanese script writing skills in Islamic elementary schools environment. This difference shows that innovations in Javanese script learning can be developed in various ways according to the context and needs of students, both through learning strategies and the application of digital technology-based media.

Improving literacy in reading and writing Javanese script through SIDORAWA multimedia is supported by interesting features in the application, such as animation, sound, interactive exercises, and fun puzzle games, and packaged with local cultural nuances, such as typical Javanese visual displays, animated children's characters in traditional clothing, and Javanese scenery and cultural objects. This research is relevant with Arif (2022) which developed the Sudoku Hanacaraka learning media, a Javanese script logic game that also highlights local cultural elements and aims to increase students' interest in learning Javanese script. Another relevance is that it started from concerns about the low interest and ability of students in learning Javanese script and offered a digital technology-based solution with a game approach. The difference is, the Sudoku Hanacaraka puzzle in the previous study was still at the prototype design stage based on design thinking and was intended as an independent exploratory media for elementary and junior high school students, while the SIDORAWA puzzle has been fully integrated into the formal learning application, directly tested in class, and proven effective in improving learning outcomes measurably at an Islamic elementary school.

The implementation of SIDORAWA in learning Javanese script shows positive results. Students appear more enthusiastic when learning, find it easier to recognize the shape of the script, and are able to read and write Javanese script better. The use of technology in this media makes learning more enjoyable and in accordance with the needs and characteristics of elementary school students. In addition to helping improve academic abilities, SIDORAWA also supports the preservation of local culture and is an example of the development of more relevant learning media in the digital era. SIDORAWA has the opportunity to be applied more widely, Islamic elementary schools and public elementary schools in general, as part of efforts to digitize local content learning. This application can be one strategy to combine literacy-based learning, digital literacy, and cultural literacy. For teachers, SIDORAWA can be a varied media choice that suits the different learning styles of students. Schools and policymakers can also work with developers to adjust the content of the application to the needs of their respective regions or curricula. In the future, there are still opportunities to develop learning media such as SIDORAWA to be more complete and easily accessible and to be used in various learning contexts, both inside and outside the classroom.

4. CONCLUSION

The implementation of SIDORAWA (Sinau Karo Dolanan Aksara Jawa) multimedia is carried out in three stages of learning. In the opening stage, the teacher introduces Javanese script with the help of images and sounds from the application. In the core stage, students are trained to read and write Javanese script through interesting animations and interactive exercises. Students can learn independently or work together in groups. In the closing stage, the teacher uses the quiz feature in the application to assess students' understanding of the material that has been learned. The SIDORAWA application combines animation, sound, and game elements with local cultural nuances so that the learning process becomes more interesting and in accordance with technological developments and students' learning needs. The implementation of SIDORAWA interactive multimedia has been proven to be effective in helping fourth-grade students of Islamic elementary schools improve their reading and writing skills in Javanese script.

SIDORAWA has great potential to be applied more widely as part of the digitalization of local content learning, both in Islamic elementary schools and public elementary schools in general. This application can help combine Javanese script learning with literacy strengthening, technology utilization, instilling character values, and cultural preservation. For teachers, SIDORAWA can be an interesting alternative media that is suitable for various types of student learning. Schools and related

parties can also collaborate with application developers so that the content can be adjusted to the needs of their respective regions. This finding also encourages the birth of digital learning media that are not only informative but also able to change the way of learning to be more interesting and meaningful.

This study has limitations because it was only conducted on fourth-grade students in one Islamic elementary school, so the results cannot be generalized to other grade levels or schools with different backgrounds. Further research is needed to test the consistency of the impact of SIDORAWA in higher grades and over a longer period of time. In addition, it is necessary to explore the application of SIDORAWA in a blended learning model so that it can be used flexibly, both in face-to-face and online learning. The development of new features in the application is also important to adapt to student needs and make learning more interesting. School support, such as the provision of facilities and teacher training, is an important supporting factor so that this technology can be implemented optimally in Javanese script learning.

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