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Development Karaja Cards Based QR Code Integrated Augmented Reality to Improve Javanese Script Writing Skills

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Abstract: The low Javanese script writing skills of students result from limited understanding of its forms and variations. This study aims to develop and test the feasibility, effectiveness, and practicality of Karaja card media based on QR Code integrated with Augmented Reality. The research employed the Borg and Gall development model. This study involved 32 grade IV students of SDN 1 Rajawana in the 2024/2025 academic year, with a small-scale trial on 9 grade IVA students and a large-scale trial on 23 grade IVB students. Data collection was carried out through tests (pretest-posttest) and non-tests in the form of interviews, questionnaires, observations, and documentation. The results of expert validation showed that this media was "very feasible" with an average score of 91.4%. Practicality was shown from the results of the teacher and student response questionnaires which gave scores of 92.5% and 91%, assessing this media as "very positive". Its effectiveness is proven through t-test (0.001 < 0.05) and N-gain 0.73 (“high” category). In conclusion, shows that QR Code-based Karaja card media with Augmented Reality is feasible, practical, and effective in improving grade IV Javanese script writing skills.

Keywords: Augmented Reality, Javanese Script, QR Code, Reusable Cards, Writing Skills

INTRODUCTION

Education plays an essential role in the formation of human resources, because education can be a means to improve the quality of human beings (Garira, 2024). Therefore, an ideal education is needed that is inclusive, relevant, and student-centered (Yusuf, 2023). This statement is in line with Permendikbudristek Number 16 of 2022 concerning learning must take place in an interactive, inspiring, fun, challenging, and motivating atmosphere. The development of student potential can be optimized through education starting from elementary school level (Che Mat & Jamaludin, 2024). Elementary school is an early stage educational institution in the formal education system that forms basic education and instills good values (Istiqomah et al., 2022). In addition, the basic skills taught in elementary school are reading, writing, and arithmetic skill (Ilmiah et al., 2025). These basic skills are a requirement that must be possessed by students to acquire knowledge (Ma’sumah et al., 2024). Permendikbud Number 7 of 2022 concerning content standards states that the scope of the material contained in the Elementary and Secondary Education curriculum includes religious education, Pancasila education, citizenship education, language, mathematics, natural sciences, social sciences, arts and culture, physical education and sports, skills/vocational, and local content.

Local content learning in elementary schools is Javanese language learning. Javanese language learning in schools is given for 2 hours in one week. This causes Javanese language learning to be very limited in time in elementary schools so that students' mastery of Javanese script material is also difficult to master. Javanese script learning according to Governor Regulation Number 55 of 2014 is a way or letter that has a form, graphic signs, system, and writing order used for Javanese language and literature in its historical development. In addition, learning Javanese script requires a process of time and insight to understand the material. This is because students must have the skills to read and write Javanese script.

Javanese script writing skills are important for understanding and preserving cultural heritage. This includes the ability to write texts in Javanese, recognize the relationship between letters and sounds, and construct words and sentences that are in accordance with correct grammar and spelling (Amalia & Wiranti, 2024).

The writing skills of students in Indonesia are still relatively low. This is evidenced by the 2022 Programme for International Student Assessment (PISA) which shows that Indonesian students scored 359 points in literacy and are classified at level 1a. This score is below the average for member countries of the Organisation for Economic Co-operation and Development (OECD), which ranges from 472 to 480 points. This low skill has an impact on learning Javanese script which requires greater perseverance. If writing Latin script is still an obstacle, then the more complex Javanese script will be increasingly difficult to master. In addition, the limited use of Javanese script and its differences from Latin letters cause students to forget easily if they are not trained repeatedly. These difficulties reduce students' interest in learning Javanese script material (Syahputri et al., 2024).

From the various obstacles and problems found, researchers also found similar obstacles at SDN 1 Rajawana. Based on the results of interviews, questionnaires, observations, diagnostic tests, and documentation, several problems were identified in the Javanese script material in grade IV at SDN 1 Rajawana. Based on the results of interviews with grade IV teacher, students still have difficulty in writing Javanese script, especially in the use of pairs and swara sandhangan and panyigeg wanda sandhangan. The learning used is still simple, namely the lecture method, writing exercises, and questions and answers with learning resources in the form of textbooks, teacher books, and Javanese script pictures. The main obstacles are difficulty remembering the form of the script, lack of routine practice, and limited interactive learning media. The learning media used are still limited to blackboards, books, and simple cards. Student interest is also low, they tend to be lazy to practice and do not try hard when they experience difficulties. This is evidenced by the results of a questionnaire from 23 students, 11 students (48%) liked wayang stories and 8 students (35%) liked geguritan. While the remaining 4 students (17%) liked Javanese script. Due to the lack of interest in Javanese script material, the skills of writing Javanese script in students are also low

Based on the results of observations when working on diagnostic questions, students still experience difficulties and errors when writing the correct Javanese script letters such as swapping the Javanese script letters Sa and Da, swapping the letters tha and nga, and writing sandhangan and pairs that are still wrong. The impact of this problem is that it results in low Javanese language scores on Javanese script material which is reflected in the achievement of student scores from 23 students, there were 14 students (61%) who scored below the minimum passing grade (KKM) of 70, while the remaining 9 students (39%) were above the KKM. This problem makes the Javanese script writing skills of students less than optimal.

Based on these problems, learning media are needed that can improve Javanese script writing skills in the form of developing QR Code-based card media integrated with Augmented Reality. With technology, learning can be made more interactive, interesting, and effective for students (David & Weinstein, 2024).

Card media is a graphic aid containing images and captions to facilitate understanding. This media is simple, practical, attractive, flexible, and increases student engagement and understanding (Dewi & Insani, 2024). This is evident in previous research in the form of Karsawa media conducted in grade three with a limited number of students showing high validity with a percentage of 90.38% for media and 96.7% for content, while its practicality reached 91.67% from teachers and 87.72% from students (Ariani, 2020). QR Code is a two-dimensional matrix code that stores text, URLs, or video links and can be accessed quickly with digital (Lopez & Box, 2025). The device as in the previous study that developed QR Code-based flashcards in third grade to increase interest in learning through access to Javanese script writing guide videos obtained a feasibility result of 94% and students' interest in learning increased from "quite interested" to "very interested" after the trial. (Ratnawati, 2024). In addition, based on previous research, learning using QR Codes increases student enthusiasm, with small group trials showing a positive response of 93.33% is very good (Insani et al.,

2023). Meanwhile, Augmented Reality is a technology that combines the real and virtual worlds in 3D form in real-time through a digital device camera (Arena et al., 2022). Learning will be more interactive, facilitating visualization of abstract material, and improving understanding of concepts that are difficult for students to reach directly. This is proven in previous research where the application of Android-based AR was able to significantly improve understanding and learning outcomes of Javanese script by displaying the 3D form of Javanese script with 89% proven results (Teknika, 2024). Based on previous research, learning using Augmented Reality can also improve students' understanding of earthquakes with 3D simulations with a success rate of 61% and help students visualize earthquakes (Zakirman et al., 2023). Previous research on Augmented Reality was also developed in the Snapchat application on the material of the 7 wonders of the world using the marker-based method with a trial of 5 volunteers with a functional success rate of 100%, usability of 84%, and portability of 100%. (Sahria & Aditya Prayoga, 2023). In addition, based on previous research, Augmented Reality in the form of books has also proven effective in improving learning outcomes and critical thinking skills of students with the results of the N-gain test of 0.5% indicating a fairly effective category (Sukasih et al., 2022).. Several previous researchers have proven that the development of Augmented Reality media can help and improve student learning outcomes.

In the previous research that has been presented, the novelty of this research lies in the development of the Kartu Karaja (Reusable Javanese Script Card) media based on QR Code and Augmented Reality. This media uses reusable cards that can be written and erased using a marker. The QR Code not only contains a video of writing Javanese script, but also a Javanese script song whose lyrics were made by the researcher himself with the tune of the song suwe ora jamu, while Augmented Reality displays 3D objects and the sound of pronouncing Javanese script through the Snapchat application, so that learning becomes more interesting. In addition, this research was conducted in grade four with trials on a small and large scale.

This research is important to understand the potential of technology in learning, especially in supporting innovative and enjoyable mastery of materials for students. The development of technology-based card media is expected to be a creative solution to overcome challenges in learning Javanese script and improve Javanese script writing skills for students. Based on the background description, this study aims to describe the development design, test the feasibility, practicality, and effectiveness of the Kartu Karaja (Reusable Javanese Script Card) media based on QR Code integrated with Augmented Reality in improving Javanese script writing skills at SDN 1 Rajawana.

METHODS

This study uses Research and Development (RnD) with a research design referring to the Borg and Gall model (Sugiyono, 2021). The sequence of research and development is explained below.

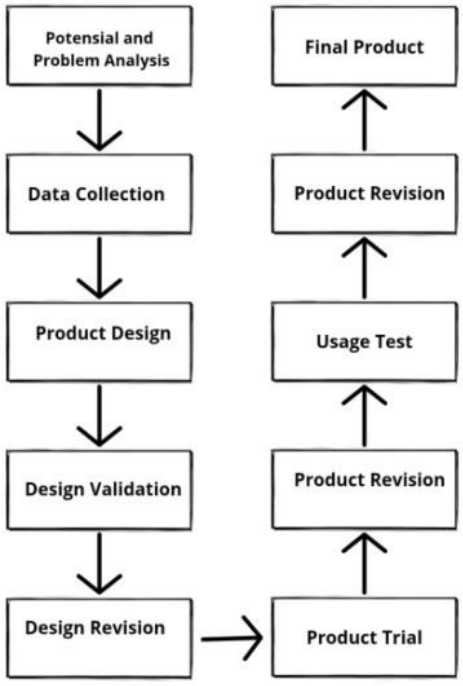


Figure 1. Stages of RnD Research Using the Borg and Gall Model

Based on the figure 1, the researcher only used eight stages. This is because the researcher only went as far as the effectiveness test stage of the Karaja card media considering the limitations of time, energy, and costs for mass production. The stages carried out include: analysis of potential and problems; data

collection; product design; design validation; design revision; product trial; product revision; and usage test. This study involved IV grade students of SDN 1 Rajawana, consisting of 23 students in a large group trial with a saturated sampling technique and 9 students in a small group trial with a purposive sampling technique, which included three students with high intellectual levels, three with medium intellectual levels, and three with low intellectual levels. This study lasted for five months, from October 2024 to February 2025, using primary data consisting of qualitative and quantitative data. Qualitative data were obtained through observation, interviews, and questionnaires, while quantitative data were obtained from the results of the pretest and posttest. This study used a pre-experimental design with a one group pretest-posttest model. Data were collected through tests in the form of essay questions changing Latin sentences to Javanese script and non-tests including observation, questionnaires, interviews, and documentation. Product feasibility was assessed by material and media experts, while practicality was measured through student and teacher response questionnaires. Meanwhile, effectiveness was analyzed using the Shapiro-Wilk normality test, Paired Samples Test, and N-Gain test to measure the increase in pretest and posttest scores in large-scale trials.

FINDING AND DISCUSSION

A. Finding

This research resulted in the development of a QR Code-based karaja card media integrated with Augmented Reality which is used to improve Javanese script writing skills. The stages of this research use the Research and Development (R&D) type of research, Sugiyono's development model by adapting 8 of the 10 existing stages.

Potential and Problems

The first stage is the analysis of problems and potentials. In this potential and problem analysis stage, researchers identified learning problems at SD N 1 Rajawana through teacher interviews and classroom observations. Some of the main problems found were that grade IV students of SD Negeri 1 Rajawana had difficulty in writing Javanese script, especially in the use of sandhangan and couples. Learning still uses lecture methods and writing exercises without adequate interactive media. The main obstacles faced were difficulty remembering the form of the script, lack of routine practice, and limited learning media, which had an impact on low Javanese script writing skills. Meanwhile, the potential analysis showed that the school had supporting facilities for wifi that could help researchers develop media.

Data collection

The next stage is data collection. Data collection was conducted through interviews with teachers, classroom observations, diagnostic tests, and questionnaires to identify the solutions needed. The results showed that 61% of students scored below the KKM (70) and only 17% liked Javanese script, while others were more interested in wayang stories or geguritan. This low interest and skill emphasizes the need for interesting card media that can help improve Javanese script writing skills. The teacher suggested that the card media not only train reading, but also writing Javanese script, and be equipped with videos or songs so that learning is more interesting and not boring by utilizing technology.

Product Design

At this stage, the researchers designed the Karaja Card media based on QR Code and Augmented Reality according to the needs of students and teachers. The 7 × 11 cm card was made in Canva, containing Javanese script patterns, couples, sandhangan, and practice questions, and was made of ivory 310 glossy laminate so that it could be written with a marker. The card is equipped with a QR Code that is connected to a video tutorial and Javanese script song on YouTube, which can be scanned using Google Lens. Augmented Reality was developed through Snapchat with a 3D model of Javanese script made in Blender and pronunciation sounds in m4a format, then imported into Lens Studio to produce a Snapchat filter that displays 3D script, materials, and audio when the card is scanned. In addition, this card is equipped with a 9 × 12 × 3 cm storage space designed in Pacdora and Canva, made of ivory 310 without glossy lamination. The results of product development are presented in the following figure:

Figure 2. Karaja Card Packaging Design

Figure 3. How to Use Karaja Card

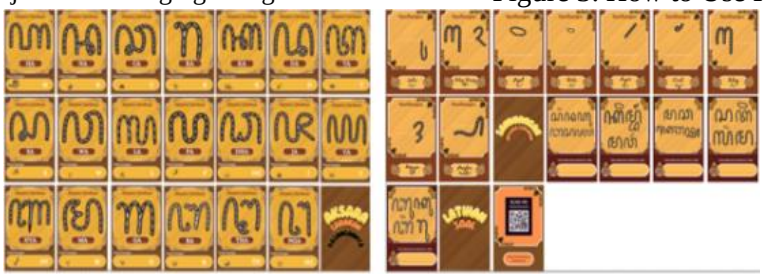


Figure 4. Karaja Card Design

Figure 5. Reusable Marker

Figure 6. Videos Writing Tutorials and Javanese Script Song

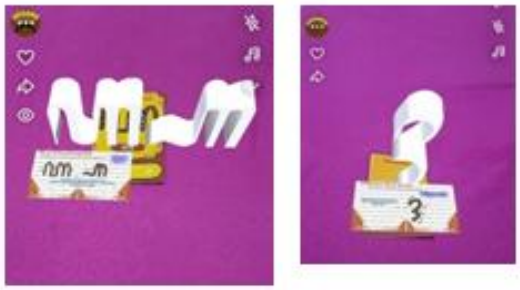


Figure 7. Augmented Reality Javanese Script

Design Validation

At this stage, the researcher validates the developed product with expert validators in terms of content and media to assess its suitability for the needs. After being evaluated by expert validators, the researcher revises the product based on the suggestions and feedback provided. The validators assess using a Likert scale of 1-5. Feasibility criteria: very feasible with a score of 86%-100%, feasible with a score of 71%-85%, quite feasible with a score of 56%-70%, unfeasible with a score of 41%-55%, and very unfeasible with a score of 25%-40%.

Table 1. Result of expert validator

Validators	Percentage (%)	Category Assessment
Material Validator	92.8%	Very Feasible
Media Validator	90.0 %	Very Feasible

The validation results show that the Karaja Card media based on QR Code and Augmented Reality is declared very feasible in terms of material and appearance. Material experts gave a score of 92.8%, while media experts gave a score of 90.0%, both in the very feasible category. Thus, this media is ready to be tested.

Design Revision

The next stage, the researcher revised the product design based on suggestions and input from the material expert validator and media expert. The material expert validator suggested that the Javanese script practice questions be focused on the skill of changing Latin script to Javanese script, with questions categorized into easy, medium, and difficult levels of difficulty. Meanwhile, the media expert validator provided input to add learning outcomes, learning objectives, and author biodata to the Kartu Karaja usage instruction sheet.

Figure 8. Instruction Sheet Before Revisian

Figure 9. Instruction Sheet After Revisian

Figure 10. Question Card Before Revisian

Figure 11. Question Card After Revisian

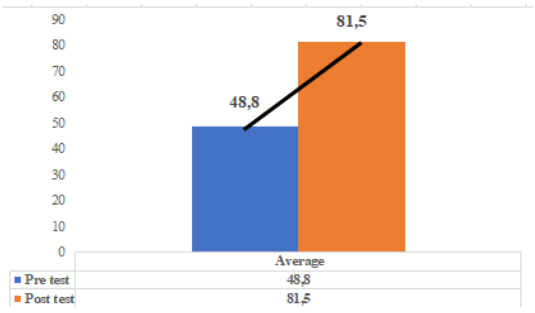
Product Trial

At this stage, the researcher conducted a small-scale trial on class 4A students of SD Negeri 1 Rajawana in the 2024/2025 academic year with a total 9, consisting of 3 students with high, medium, and low abilities. The stages include pretest, learning with QR Code and Augmented Reality-based Karaja Cards, posttest, and filling out response questionnaires by students and teachers. The response questionnaire uses a Likert Scale of 1-5 with practicality criteria: very practical (86% 100%), practical (71%-85%), quite practical (56%-70%), impractical (41%-55%), and very impractical (25%-40%). Meanwhile, the pretest and posttest data were analyzed to see the increase in learning outcomes and calculated using the N-Gain formula to measure its effectiveness.

Table 2. Result questionnaire in a small-scale trial

Respondents	Percentage (%)	Criteria
Teacher	92.0 %	Very Practical
Learners	90.4%	Very Practical

From the data displayed in table 2, it shows that the responses of teachers and students in small-scale classes are very positive towards the use of QR Code-based karaja card media integrated with Augmented Reality because they get a score above 86%.



Increase ——— = 32.7

Figure 12. Average Results of Pre-test and Post-test Small Scale Trial

The figure 12 shows an increase in the pretest and posttest scores from the small-scale trial, namely 32.7.

Table 3. N-Gain test results small scale trial

Action	Average	N-Gain	Category
Pre-test	32.7	0.64	Moderate
Post test			

Based on Table 3, the results show that grade IV students of SD Negeri 1 Rajawana consisting of 9 students experienced an increase after using Karaja learning media of 0.64 with a moderate increase category and quite effective in improving Javanese script writing skills.

Product Revisian

At this stage, the researcher revised the small-scale product trial design based on feedback from teachers and students. The revision involved simplifying the card usage instructions to make them easier to understand. After the revision, the product was ready for broader testing. Additionally, the results of student and teacher responses, the increase in pretest and posttest scores, and the N-Gain indicate that the media is suitable for large-scale trials.

Usage Test

At this stage, a large-scale trial was conducted on 23 class 4B students of SD Negeri 1 Rajawana in the 2024/2025 academic year using QR Code-based Karaja card media integrated with Augmented Reality in Javanese script learning. This aimed to assess the product's effectiveness based on learning outcomes. The study used a pre-experimental one-group pretest posttest design, where students completed a Javanese script writing task before and after treatment by converting Latin text into Javanese script.

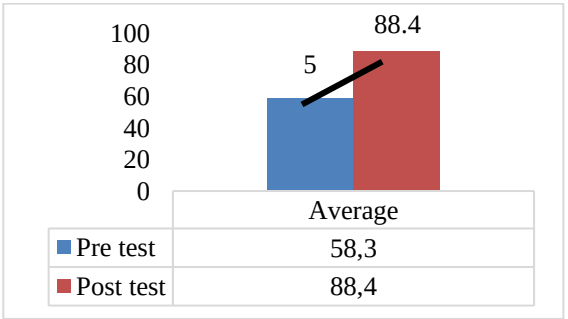


Figure 13. Average Results of Pre-test and Post-test

Figure 13 shows an increase in students' average learning outcomes by 30.1 in large-scale trials, indicating a difference before and after using QR Code-based Karaja media with Augmented Reality. A normality test was then conducted to determine data distribution, with significance values 0.05 indicating normal distribution. The results are summarized in Table 4.

Table 4. Data normality test results

Action	Shapiro Wilk			
	Mean	df	Sig	Category
Pre test	58.3	23	.375	Normal
Post test	88.4	23	.108	Normal

Based on Table 4, because the sample used is less than 50, the Shapiro Wilk test is used. The pretest significance value is 0.375 and the posttest is 0.108, both above 0.05, indicating normal data distribution. Next, the Paired Sample T-test was conducted. A significance value <0.05 indicates a significant difference in Javanese script writing skills between pretest and posttest, while >0.05 indicates no significant difference. The results are shown in Table 5.

Table 5. Paired sample t-test results

Action	T statistic	Mean	Df	Sig. (2-tailed)
Pre-test	-16,910	58.3	23	.001
Post test		88.4		

Based on Table 5, the significance value (2 tailed) is 0.001< 0.05 indicating a difference in pretest and posttest results, meaning Karaja media effectively improves Javanese script writing skills in grade IV students at SD Negeri 1 Rajawana.The last test in this study was the N-Gain test to determine and measure the extent to which cognitive learning outcomes increased. The average increase in learning outcomes was analyzed through the N-Gain test to see the effectiveness of the development. The decision in this test is based on the following criteria: low if n-gain ≤0.3; moderate if 0.3 <n-gain ≤ 0.7; and high n-gain> 0.7. The results of the N-Gain Test analysis are shown in table 6.

Table 6. N-Gain test results

Action	Average	N-Gain	Category
Pre-test	30.1	0.73	High
Post test			

Based on Table 6, it was found that grade IV students of SD Negeri 1 Rajawana consisting of 23 students experienced an increase after using the Karaja learning media of 0.73 with a high increase category and an effective level of effectiveness in Javanese script writing skills. Additionally, to assess the practicality of this media in large-scale trials, the researcher analyzed teacher and student responses. The results are presented in Table 7.

Table 7. Result of questionnaire in a large-scale trial

Respondents	Percentage (%)	Criteria
Teacher	93.0 %	Very Practical
Students	91.2 %	Very Practical

From the data displayed in Table 7, it shows that the responses of teachers and students in large-scale classes are very positive towards the use of QR Code-based karaja card media integrated with Augmented Reality because they get a score above 86%. Based on Likert scale questionnaire results, the QR Code-based Karaja card media integrated with Augmented Reality is considered practical for learning activities. The results of the data analysis showed that the Karaja card media based on QR Code integrated with Augmented Reality met the criteria of feasibility, practicality, and effectiveness in improving Javanese script writing skills in Javanese language learning. The Karaja Card Media (Reusable Javanese Script Card) based on QR Code and Augmented Reality has several supporting factors that make it superior as an innovative learning media.

Discussion

This study aims to develop and evaluate the feasibility, practicality, and effectiveness of the Karaja Card based on QR Code integrated with Augmented Reality using the Research and Development (R&D) method with the Borg and Gall model up to the eighth stage, namely the usage trial. This media was developed to enhance the Javanese script writing skills of fourth-grade elementary school students. The card is designed with reusable material that can be written on and erased using a marker. Additionally, it includes a barcode linking to video tutorials on Javanese script writing and a Javanese script song to help students remember the characters. For Augmented Reality, the researcher used the Snapchat application to display 3D models of Javanese script along with their pronunciation. The results of the feasibility assessment were analyzed using a Likert scale of 1-5 with the assessment category being the criteria very feasible if it obtainsscore 86% - 100%, criteria worthy if getting a score of 71% - 85%, criteria quite worthy if getting a score of 56% - 70%, criteria not worthy if getting a score of 41% -55%, and criteria very not worthy if getting a score of 25% -40%. Subject matter expert assessed aspects of content suitability with the curriculum, completeness of the material, systematic presentation, and readability, and gave a score of 92.8 percent, which is included in the very appropriate category. Meanwhile, media experts assessed aspects of visual appearance, ease of use, text readability, and media appeal, with a result of 90.0 percent, also in the very appropriate category.

The practicality of the media was tested through a questionnaire of teacher and student responses using a Likert scale of 1-5 with the assessment category being the criteria very practical if it obtainedscore 86% - 100%, practical criteria if the score is 71% - 85%, quite practical criteria if the score is 56% - 70%, impractical criteria if the score is 41% -55%, and very impractical criteria if the score is 25% - 40%. The teacher response questionnaire consists of 20 questions covering aspects of media suitability, language clarity, design, ease of use, and technological innovation. The student response questionnaire consists of 15 questions assessing attractiveness, understanding, learning suitability, design, benefits, and learning motivation. The results of a small-scale trial with 9 students in class 4A of SDN 1 Rajawana showed that the teacher gave a score of 92.0 percent, and the students 90.4%, both of which were categorized as very practical. In a large-scale trial with 23 students in class 4B, the teacher's score reached 93.0%, and the students 91.2%, which was also categorized as very practical. These results prove that this media is easy to use, interesting, and helps students in learning Javanese script.

In terms of effectiveness, the increase in learning outcomes after using the media reached 30.1 points, indicating a positive impact on understanding Javanese script. The Shapiro Wilk Normality Test showed that the data was normally distributed with a significance value of 0.375 for the pretest and 0.108 for the posttest

because both were more than 0.05. Furthermore, the Paired Sample T-test showed a significance value of 0.001 <0.05, which means there was a significant difference between before and after using the media. The N-Gain test with a score of 0.73 is included in the high category, indicating that this media is effective in improving Javanese script writing skills.

The Karaja Card (Reusable Javanese Script Card) media based on QR Code and Augmented Reality has several supporting factors that make it superior as an innovative learning media. The first factor that makes this media successful is its reusable nature, which allows students to write and erase without replacing the card. With its reusable nature, this card supports the principle of continuous learning and can be used in the long term (Rodia & Mawardah, 2024). The second factor is the integration of the use of QR Codes to facilitate access to digital learning resources (Paul & Naikar, 2024). In addition, QR Codes allow students to learn independently, making learning more efficient and interactive (Handayani & Haryati, 2024). This QR Code provides video tutorials and Javanese script songs to improve students' understanding of Javanese script. This method is very suitable for students with an auditory learning style, who find it easier to understand material through sound or song (Febri Artanto Program Studi et al., 2023). The third factor is the integration of Augmented Reality through the Snapchat application, presenting a more interactive and enjoyable learning experience (Sahria & Aditya Prayoga, 2023). Augmented Reality makes learning more interesting for students, makes it easier to understand the material through visual simulations, encourages collaboration, and increases student creativity (Permana et al., 2022). This media also has advantages in terms of portability, because it is in the form of a card that is easy to carry anywhere (Nasihah et al., 2025). Students can use it inside or outside the classroom, so they can learn flexibly without being tied to a particular location. With these advantages, Karaja cards is an innovative, interesting, and effective learning media, helping students understand and write Javanese script more easily and enjoyably. The development of Karaja card based on QR Code integrated with Augmented Reality can be improved with gamification features, automated evaluation, and AR enhancements However, there are still obstacles such as limited devices and cards that are easily damaged. So it requires stronger and thicker.

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REFERENCE

Amalia, I. D., & Wiranti, D. A. (2024). *AKSARA JAWA LEGENA SISWA KELAS III SDN BATUKALI*. *7*(2), 105–118.

Arena, F., Collotta, M., Pau, G., & Termine, F. (2022). An Overview of Augmented Reality. *Computers*, *11*(2). https://doi.org/10.3390/computers11020028

Ariani, D. (2020). Pengembangan Media Karsawa (Kartu Aksara Jawa) Untuk Pembelajaran Menulis Aksara Jawa Di Kelas Iii Sekolah Dasar. *Jpgsd*, *08*(01), 154–164.

Artanto, D. F. (2023). Pengaruh Penerapan Gaya Belajar Auditori Mendengarkan Lagu Anak Terhadap Hasil Belajar Siswa Usia Sekolah Dasar. *Jurnal Pendidikan Sendratasik*, *12*(1), 180-195.

Che Mat, N., & Jamaludin, K. A. (2024). Effectiveness of Practices and Applications of Student-Centered Teaching and Learning in Primary Schools: A Systematic Literature Review. *International Journal of Academic Research in Progressive Education and Development*, *13*(3). https://doi.org/10.6007/ijarped/v13-i3/21733

David, L., & Weinstein, N. (2024). Using technology to make learning fun:

technology use is best made fun and challenging to optimize intrinsic motivation and engagement. *European Journal of Psychology of Education*, *39*(2), 1441–1463. https://doi.org/10.1007/s10212-023-00734-0

Dewi, S. M., & Insani, N. H. (2024). *Development of 4C-Integrated Karthon (Kartu Pacelathon) as an Innovative Learning Media for Javanese Dialogue*. *16*, 3524–3536. https://doi.org/10.35445/alishlah.v16i3.5445

Garira, E. (2024). A Systemic Perspective to Realizing and Improving Quality of Education in Schools. *International Journal of Educational Reform*, 1–16. https://doi.org/10.1177/10567879231222862

Handayani, F. A., & Haryati, T. (2024). Pemanfaatan Media Pembelajaran QR-Code Sebagai Upaya Implementasi Pendidikan Sesuai Kodrat Zaman KHD di SMP Negeri 6 Semarang. *Jurnal Ilmiah Profesi Pendidikan*, *9*(2), 809–815. https://doi.org/10.29303/jipp.v9i2.2180

Insani, F., Tahir, M., & Erfan, M. (2023). Pengembangan Media Kartu Qimono (QR Domino) Pada Pembelajaran IPA Materi Pernapasan Untuk Siswa Kelas V SDN 22 Ampenan. *Jurnal Ilmiah Profesi Pendidikan*, *8*(3), 1631–1638. https://doi.org/10.29303/jipp.v8i3.1491

Istiqomah, I., Enggar Kencana Dewi, S., & Kholidin, N. (2022). Pengaruh Budaya Sekolah terhadap Karakter Peserta Didik di Sekolah Dasar. *FingeR: Journal of Elementary School*, *1*(1), 11–19. https://doi.org/10.30599/finger.v1i1.94

Lopez, R., & Box, G. P. O. (2025). ScienceDirect Review and concepts on how construction and facilities management can utilize barcode and QR code technology to access documents onsite. *Procedia Computer Science*, *253*, 1313–1322. https://doi.org/10.1016/j.procs.2025.01.193

Ma'sumah, Aini, S. N., & Oktaviana, A. W. (2024). Tri Pusat Pendidikan Sebagai Sarana Pendidikan Karakter Anak Sekolah Dasar. *Buletin Pengabdian Multidisiplin*, *2*(1), 09–19. https://doi.org/10.62385/budimul.v2i1.87

Nasihah, A. D., Prabowo, D. S., Hidayat, M. W., Abdurrahman, U. I. N. K. H., Pekalongan, W., & Salatiga, U. I. N. (2025). *PENGARUH MEDIA KAPIJA TERHADAP KEMAMPUAN MEMBACA KATA BERAKSARA JAWA SISWA KELAS 3 MADRASAH IBTIDAIYAH*.

OECD Education GPS. (n.d). Retrieved March 8, 2025, from OECD Interact website:http://gpseducation.oecd.org/

Paul, M., & Naikar, S. (2024). *Innovative Uses of QR Codes in Academic Libraries : Benefits and Challenges*. *July*.

Pergub Provinsi Jawa Tengah 2014 No 55, Bahasa, Sastra, dan Aksara Jawa.

Permendikburistek 2022 No. 16, Standar Proses pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Menengah.

Permendikbud 200 No. 7, Standar Isi pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Menengah.

Permana, R., Eka Praja Wiyata Mandala, Dewi Eka Putri, & Musli Yanto. (2022). Penerapan Teknologi Augmented Reality dan Virtual Reality dalam Peningkatan Pembelajaran Siswa Sekolah Dasar. *Majalah Ilmiah UPI YPTK*, *29*, 7–12. https://doi.org/10.35134/jmi.v29i1.90

Ratnawati, D. (2024). Pengembangan Media Flashcard Aksara Jawa Berbasis Quick Response Code Untuk Meningkatkan Minat Belajar Kelas III SDN Jambangan Kabupaten Kediri (Doctoral dissertation, IAIN Kediri).

Rodia, R. S., & Mawardah, M. (2024). Pengaruh Media Busy Book Terhadap Kemampuan Menulis Permulaan Pada Anak Autis Spectrum Syndrom. *Jurnal Psikologi : Jurnal Ilmiah Fakultas Psikologi Universitas Yudharta Pasuruan*, *11*(1), 211–222. https://doi.org/10.35891/jip.v11i1.4862

Sahria, Y., & Aditya Prayoga, M. R. (2023). Pemanfaatan Teknologi Augmented Reality Sebagai Media Pengenalan 7 Keajaiban Dunia Dengan Metode Marker Based. *Simtek : Jurnal Sistem Informasi Dan Teknik Komputer*, *8*(1), 30–37. https://doi.org/10.51876/simtek.v8i1.169

Sugiyono (2021). Metode Penelitian Pendidikan. Bandung: Alfabeta

Sukasih, S., Wulandari, D., & Permana, Z. F. (2022). The Effectiveness of Augmented Reality Book to Improve Critical Thinking Ability At Elementary School Students. *Journal of Education for Sustainability and Diversity*, *1*(1), 18–28. https://doi.org/10.57142/jesd.v1i1.2

Syahputri, K. N. A., Sayekti, I. C., & Tasmun, T. (2024). Peningkatan Keterampilan Menulis Aksara Jawa melalui Model Teams Games Tournament (TGT) pada Peserta Didik Kelas VI SD. *Fondatia*, *8*(2), 126–139. https://doi.org/10.36088/fondatia.v8i2.4626

Teknika, J. (2024). *APLIKASI EDUKASI PENGENALAN DAN PENGASAH DAYA INGAT*. *16*(2), 87–96. https://doi.org/10.30736/jt.v16i2.1251

Tsani, A. F., Akbar, M. H., & Rijal, A. (2025). PILAR PENDIDIKAN DASAR: ANALISIS PENGEMBANGAN FISIK HINGGA KREATIFITAS DI SEKOLAH DASAR. *Jurnal Ilmiah Research Student*, *2*(1), 165-174.

Yusuf, ali anwar. (2023). *Filsafat Pendidikan KONTEMPORER*. *07*(1), 389–402.

Zakirman, Z., Sukmayadi, D., Widiasih, W., & Risha, N. (2023). The Potential for The Development of Augmented Reality Media to Increase Student Understanding of Earthquake Material. *Jurnal Ilmiah Profesi Pendidikan*, *8*(4), 2173–2183. https://doi.org/10.29303/jipp.v8i4.1672