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Interactive Digital Media for Javanese Script Learning: A Smart Apps Creator-Based Game for Fifth-Grade Students

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Abstract. This study developed an interactive digital game for Javanese script learning using Smart Apps Creator (SAC) and examined its feasibility and potential to support fifth-grade students' learning. The study employed a Research and Development approach using an adapted ADDIE model consisting of analysis, design, development, implementation, and evaluation. The development was conducted at SD Negeri 01 Bandungharjo, Grobogan, with 26 fifth-grade students. Preliminary observation and assessment indicated limited use of technology-supported media, reliance on lectures and exercises, and low achievement in Javanese script. The developed application, named MANDRAWA, integrated instructional content with game-based activities covering Javanese script, pasangan, and sandhangan.

Content validity was assessed by two material experts using Gregory's content validity coefficient, while media validity was assessed by two media experts. Teacher and student responses were also collected, and learning achievement was examined through pretest and posttest scores. After revision based on expert feedback, the material and media validity coefficients reached 1.00. Teacher response reached 95%, while student response reached 100%. The mean achievement score increased from 45 on the pretest to 94 on the posttest, representing a reported 48% improvement, and all students reached the minimum mastery criterion in the posttest. These findings indicate that an interactive SAC-based game can function as a feasible and engaging supplementary medium for Javanese script learning in elementary school, while also providing a technology-supported learning experience.

Keywords: digital learning media; educational game; Javanese script; Smart Apps Creator; elementary education

Introduction

Use Javanese script is an important component of Javanese language learning and represents a written cultural heritage that needs to remain accessible to younger generations. In elementary education, however, students may experience difficulty recognizing, reading, and writing Javanese characters. Previous studies cited in the source research have reported that learners encounter persistent difficulties with Javanese script and that conventional learning resources may not provide sufficient support for developing these skills (Hidayati et al., 2019; Widodo & Hanifah, 2020). These difficulties become more challenging when instruction relies mainly on verbal explanation, textbooks, or routine exercises.

Learning media can provide an important bridge between abstract information and learners' concrete experiences. Arsyad (2013) describes instructional media as tools that support the delivery of learning messages, while Darmawan (2013) emphasizes the role of learning technology in expanding opportunities for educational innovation. For elementary learners, media that combines visual elements, interaction, practice, and play may help sustain

attention and create a more active learning environment. The source study likewise found that students in Grade V became bored when Javanese script was presented primarily through lectures and exercises, while the school had not yet used technology-based media for this topic.

Digital game-based learning offers one possible response to this problem because it connects practice with interaction and immediate engagement. Research cited in the original study has explored several approaches to Javanese script learning, including letter cards, educational games, Android applications, augmented reality, and digital learning media. Hidayati et al. (2019) developed letter-card media for reading Javanese script, while Nisa et al. (2017) developed the Hanacaraka Android application. Ramadani and Huda (2020) investigated an Android-based Javanese script educational game using augmented reality. Arifin et al. (2018) reported positive learning outcomes from a mobile Javanese script game. These studies demonstrate the potential of interactive technology, but they also show that digital media can be designed in different ways according to learners' needs and available resources.

Smart Apps Creator (SAC) is particularly relevant for educational development because it enables the creation of application-based learning media without requiring conventional programming. The source study explains that SAC can produce application outputs that can be accessed through devices such as smartphones and computers and can be developed using a presentation-like interface (Azizah, 2020; Khasanah et al., 2020; Suhartati, 2021). This characteristic makes SAC a practical option for teachers or educational developers who need to create interactive materials without extensive coding skills.

The present study builds on these considerations by examining the MANDRAWA learning game developed for fifth-grade Javanese script instruction. The application combines instructional material with game activities rather than separating learning from practice. Its material section covers Javanese script, pasangan, and sandhangan, while its game section provides

gladhen (practice) and cangkriman (quiz) activities. The novelty of the present article lies in presenting the development as an integrated interactive digital learning medium and in focusing on how its design, expert validation, user responses, and pretest–posttest outcomes support its educational use.

Accordingly, this study aimed to: (1) describe the need for interactive digital media in fifth-grade Javanese script learning; (2) describe the design and development of a Smart Apps Creator-based learning game; (3) determine the content and media validity of the developed application; and (4) examine teacher and student responses and changes in students' learning achievement after using the application.

Materials (if any) and Methodology

This study used a Research and Development (R&D) approach. The development procedure was adapted from the ADDIE framework, consisting of Analysis, Design, Development, Implementation, and Evaluation (Rusdi, 2018). The study was conducted at SD Negeri 01 Bandungharjo, Grobogan, and involved the fifth-grade class. The class consisted of 26 students. The development focused on Javanese script material aligned with the learning needs identified during the preliminary study.

Data were collected through observation, tests, questionnaires, and documentation. Observation was used to identify classroom conditions, instructional practices, existing learning media, and students' learning needs. A 30-item achievement test consisting of 20 multiple-choice items and 10 essay items was used as the pretest and posttest instrument. Documentation included evidence of classroom activities, existing media, student data, and assessment results.

The analysis stage identified the gap between students' learning needs and the media available in the classroom. The design stage then established the

application structure, learning content, game activities, and visual presentation. The development stage involved producing the application in Smart Apps Creator and submitting the product for expert validation. Two experts assessed the material and two experts assessed the media. Expert judgments were analyzed using Gregory's content validity coefficient, which ranges from 0 to 1. The product was revised according to expert suggestions before classroom implementation.

During implementation, the teacher introduced the application and explained how to operate the game. Students accessed the application individually and studied the material before completing the available exercises. The source study reports that students were given the application through a class WhatsApp group and worked with the media for approximately one week before completing the posttest. Student and teacher responses were analyzed descriptively using percentage scores. Learning achievement was examined by comparing the mean pretest and posttest scores.

Development procedure

Analysis. The preliminary observation showed that the teacher had not previously used technology-based learning media for Javanese script. Instruction relied mainly on lectures and exercises, and students tended to depend on the internet when completing Javanese script assignments. The initial achievement data also indicated weak understanding.

Design. The application was planned as a staged learning experience with two principal sections: material and dolanan (games). The material section incorporated interactive activities so that students did not only read or listen, while the dolanan section provided practice and quiz activities.

Development. The MANDRAWA application was created with Smart Apps Creator. The content included Javanese script, pasangan from ha to la, and sandhangan swara and panyigeg wanda. Visual materials were prepared using supporting software, while the application structure and interactions were assembled in SAC.

Implementation. After expert review and revision, the application was introduced to the teacher and students. Students used the application to study the material and complete game-based activities, followed by the posttest.

Evaluation. Evaluation incorporated expert feedback, teacher and student responses, and the difference between pretest and posttest achievement. Revisions were made after the initial media validation.

Results and Discussion

Learning needs identified in the preliminary study

The preliminary study established a clear need for more interactive support in Javanese script instruction. Classroom observation found that the teacher had not used technology-based learning media for the topic. The dominant instructional approach was lecture and exercise-based learning, while available learning resources were limited. Students reported receiving Javanese script instruction from Grade III, yet their understanding remained weak because they were not sufficiently interested in the way the material was delivered.

The initial achievement data reinforced this finding. In a five-item preliminary assessment, the class mean was 56. In the 30-item pretest used in the development study, the mean was 45; the lowest score was 20 and the highest was 97. Only one student reached the stated minimum mastery criterion of 70, while 25 students did not. These results provided a practical basis for designing a medium that could make practice more engaging while maintaining the target content.

Design of the interactive digital game

The developed product was named MANDRAWA, a Javanese term associated in the source study with cangkriman. The application was structured to combine instructional content and game interaction. The opening sequence led users to the main menu, followed by access to the material and game

sections. The material section contained three learning areas: Aksara, Pasangan, and Sandhangan. Interactive activities were embedded in these sections. For example, students could arrange or match Javanese characters and select appropriate sandhangan. The game section contained gladhen and cangkriman. Gladhen consisted of 10 practice questions, while cangkriman consisted of 20 multiple-choice questions. The scoring system was designed to provide immediate evidence of performance and encourage repeated practice.

This design responds to the learning problem identified in the preliminary stage: students needed more than passive exposure to characters. By combining explanation, visual representation, matching activities, practice, and quizzes, the application attempted to turn character recognition and interpretation into active learning tasks. This approach is consistent with previous work cited in the source study showing the usefulness of games and digital applications for Javanese script learning (Arifin et al., 2018; Nisa et al., 2017; Ramadani & Huda, 2020).

Expert validation and revision

The initial material validation involved 12 indicators covering relevance, feasibility, competence, and content. Both material experts rated all indicators in the strong-relevance category. Gregory's coefficient was $12/(0+0+0+12) = 1.00$, indicating very high content validity. The product was therefore considered suitable for classroom testing without material revision.

The first media validation involved 24 indicators covering alignment, game feasibility, contribution, and design elements. Before revision, the Gregory coefficient was 0.50, placing the product in the medium category. The validators recommended improvements, including more appropriate game icons, reducing the number of pasangan items, and refining the question structure so that pasangan, sandhangan, and Javanese writing were presented in clearer forms. After these revisions, all 24 indicators were categorized as strongly relevant by both validators, producing a Gregory coefficient of 1.00. This progression

demonstrates the role of iterative expert review in improving the usability and instructional alignment of digital learning media.

Validation component	Initial coefficient	Post- revision coefficient	Interpretation
Material validity	1.00	1.00	Very high
Media validity	0.50	1.00	Very high after revision

Table 1. Expert validation of the MANDRAWA learning game

Teacher and student responses

Following revision, the application was tested with the fifth-grade teacher and students. The teacher response reached 95%, categorized in the source study as very relevant or highly effective for use. The response questionnaire addressed alignment with Grade V material, ease of use, support for teachers, attractiveness, clarity of language and font, durability, student enthusiasm, and suitability of the material and questions. The result suggests that the application was perceived as practical from the teacher's perspective.

Student responses were very positive. Fifteen students completed the response questionnaire, with 225 affirmative responses out of 225 possible responses, resulting in 100%. The questionnaire included aspects such as attractiveness, understanding of the material, enjoyment, concentration, motivation, clarity of text and audio, sequence of material, opportunities to learn using Android or a computer, and willingness to use the medium again. The result indicates strong acceptance of the game-based learning format.

Respondent	Result	Category
Teacher	95%	Very relevant / highly effective
Students	100%	Very relevant / usable without revision

Table 2. User responses to the interactive digital learning game

Changes in learning achievement

The pretest–posttest comparison provides the main evidence concerning learning achievement. The mean pretest score was 45, whereas the mean posttest score reached 94. The source study reports a 48% percentage improvement. The lowest posttest score was 80 and the highest was 100, and all students reached the minimum mastery criterion of 70. The individual score pattern also shows improvement across the class, with every student obtaining a posttest score above the stated criterion.

Measure	Pretest	Posttest
Mean score	45	94
Lowest score	20	80
Highest score	97	100
Students reaching KKM (70)	1	26
Reported percentage improvement	—	48%

Table 3. Fifth-grade students' learning achievement before and after using MANDRAWA

The increase should be interpreted in relation to the study design. The project used a development study with a pretest–posttest comparison in one class rather than a randomized control-group experiment. Therefore, the findings support the usefulness and potential effectiveness of the developed medium in this setting, but they do not by themselves establish that the game was the sole cause of the observed increase. Nevertheless, the substantial change from a mean of 45 to 94, together with the positive teacher and student responses, provides converging evidence that the application functioned well as a supplementary learning medium.

Conclusion and Recommendation

The study developed an interactive digital learning medium for Javanese script using Smart Apps Creator. The resulting MANDRAWA application integrated Javanese script content with interactive learning activities, practice, and quizzes. The development process followed an adapted ADDIE framework and responded directly to the identified need for more engaging and technology-supported learning media in Grade V.

The final product demonstrated very high validity after revision. Material validation reached a Gregory coefficient of 1.00, and media validation increased from 0.50 before revision to 1.00 after revision. Teacher response reached 95%, while student response reached 100%. Students' mean achievement increased from 45 in the pretest to 94 in the posttest, with all students reaching the minimum mastery criterion. Within the limitations of the one-group development context, these results indicate that the SAC-based game was feasible, well received, and potentially useful for supporting Javanese script learning.

For teachers, the application can be used as supplementary media alongside classroom instruction rather than as a complete replacement for teacher guidance. Schools may encourage the development of similar technology-supported media for local-language learning. Future researchers are recommended to broaden the content, involve larger and more diverse samples, examine longer-term retention, and use comparison groups or quasi-experimental designs to strengthen evidence of effectiveness.

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