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Sinau: Javanese Educational Games for Early Childhood as an Effort to Preserve Javanese Heritage

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Abstract
Preserving the Javanese language is a collective responsibility to safeguard Indonesia's cultural heritage. This study aims to develop Sinau, a Javanese language learning game for early childhood (ages 4–8), focusing on vocabulary and unggah-ungguh (Kromo and Ngoko) with correct pronunciation. Utilizing the Game Development Life Cycle (GDLC) and Guided Discovery methods, the game was designed to facilitate active learning both at home and school. GDLC encompassed pre-production (concept, teaching methods, and prototype development), production (game creation with Unity, incorporating educational content, visuals, and sound), and post-production phases. Testing involved 10 second-grade students and 2 teachers, with observations despite the game's primary target being younger children. Participants evaluated the game by playing it and completing a 10-question Likert-scale questionnaire. Usability was measured using the System Usability Scale (SUS), resulting in a score of 74.17, indicating an acceptable level with a good adjective rating. These results demonstrate that Sinau is well-received and effective for Javanese language learning. While the study did not directly test early childhood learning outcomes, the findings suggest the game's potential for educational use, with recommendations for improving user experience and content to enhance its effectiveness further.

Keywords: early childhood; guided discovery; javanese; learning games; system usability scale

INTRODUCTION

Javanese, as a regional language in Indonesia, plays a vital role for early childhood in forming cultural identity (Yoseptry, 2022), developing cognitive abilities (Ariawan et al., 2023), and strengthening social relationships with family and community. Through teaching their mother tongue, such as Javanese, children can recognize and understand their cultural heritage from an early age, contributing to the preservation of their cultural heritage (Wulandari & Nurdiati, 2023). However, as time progresses, the number of Javanese speakers continues to decline, especially among younger generations. This results in fewer individuals who are able to speak, write, read, or fully understand the language (Sagimin, 2020). Therefore, without serious efforts to sustain it, the Javanese language's continuity across generations faces significant challenges.

Mujahid et al. (2023) found that game-based learning media could be useful for teaching Javanese because it keeps students engaged and makes the subject easier to understand. Currently, several Javanese language learning games have been developed to help increase children's interest in learning the language. One study shows that the development of technology-based educational games, such as those created by Wijayanti et al. (2021), successfully provides a more interactive and enjoyable approach for children to learn Javanese, assisting teachers and parents in teaching them Javanese vocabulary. Another study, undertaken by Khoirunnisa & Huda (2023), developed a mobile-based Javanese educational

game called *Dinggo* to assist elementary school instructors in teaching Javanese in a more enjoyable and interactive way.

The use of the Javanese language at an early age is vital for the Javanese community to preserve their language and culture (Rahman et al., 2022). In addition to serving as a means of communication, the Javanese language plays a crucial role in fostering ethical values through the practice of *unggah-ungguh*. *Unggah-ungguh* can be understood as a set of guidelines in the Javanese language that governs how individuals communicate using polite and respectful language, for example, speaking *Kromo* to parents or older people and speaking *Ngoko* to a friend or to a younger person (Lafamane, 2020). The research by Firmandasari et al. (2020) and Khoirunnisa & Huda (2023), which developed games to facilitate the learning process of Javanese *Kromo*, aligns with this.

Efforts to preserve the Javanese language require innovative approaches, as existing educational tools are not widely utilized by parents or schools to enhance language learning. This study introduces an educational game developed using the Guided Discovery Learning method to teach Javanese. Guided discovery encourages students to actively engage in learning through trial and error, fostering critical thinking and intellectual discipline while the teacher acts as a facilitator. This process-oriented approach helps students independently analyze and discover principles (Simamora et al., 2019), promoting a deeper understanding of the material (Yerimadesi et al., 2023). By employing this model, the game not only enhances student participation but also supports the development of cognitive and problem-solving skills, making it an effective tool for Javanese language education.

Game-based learning has been widely recognized for its effectiveness in enhancing language acquisition. For instance, Ghazy et al. (2021) reported that using game-based learning in English language education significantly increased students' interest, as they found the process both challenging and enjoyable. This heightened engagement also translated into improved academic achievement. Similarly, the Guided Discovery learning method has shown notable success. Asmoro (2022), reported an improvement in students' learning completeness when using this approach for English instruction. Guided Discovery is an interactive learning model where students actively uncover knowledge through structured guidance, fostering deeper understanding and better retention of the material. This method promotes exploration and critical thinking within a supportive framework (Batubara, 2019; Simamora et al., 2019). By integrating the findings of Asmoro (2022) and Ghazy et al. (2021) Guided Discovery game-based learning combines hands-on, interactive experiences with structured exploration, enhancing motivation, self-directed learning, and cognitive development.

In the context of Javanese language learning, the *Kenmriki* game (Puspita, 2022) offered platforms for learning Javanese, albeit without a detailed explanation of the game's Javanese language material. However, given the significance of learning ethics in Javanese, which employs distinct vocabulary depending on the interlocutor's age (older or younger), it is essential to develop a game that preserves the Javanese language, including *unggah-ungguh*, for early childhood learning. Despite the proven effectiveness of the Guided Discovery method in other language learning contexts (Asmoro, 2022), its application to Javanese language games remains limited. By integrating Guided Discovery principles into an engaging game design, children can learn Javanese vocabulary, pronunciation, and proper usage of formal and informal language forms. Simultaneously, this approach introduces cultural values such as *unggah-ungguh*, making the learning process enjoyable while fostering cultural appreciation and ethical communication skills.

The goal of this research is to develop the *Sinau* game, a Javanese educational game for early childhood learning, using the Guided Discovery method. The game's development follows the Game Development Life Cycle (GDLC) method. This educational game tailors its content to the abilities of young children, facilitating the learning of basic vocabulary, Javanese

pronunciation, and appropriate levels of formality (*Kromo* for elders and *Ngoko* for peers or younger individuals). This Javanese-Indonesian learning game aims to enhance children's Javanese proficiency and maintain the language's continuity.

METHOD

The development of the *Sinau* game, an educational tool for early childhood Javanese learning, followed the Game Development Life Cycle (GDLC) due to its iterative approach, allowing flexibility and integration of feedback at each stage. As shown in Figure 1, the GDLC consists of six stages: initiation, pre-production, production, testing, beta, and release (Saputra et al., 2022).

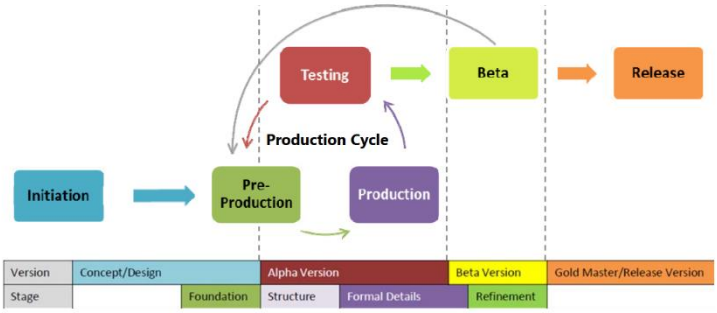

Figure 1. Game development life cycle method

In the initiation stage, the game's concept and target audience were defined. This stage resulted in a clear game description. During pre-production, the concept was refined, including its genre, gameplay, storyline, characters, mechanics, challenges, and technical aspects, documented in a Game Design Document (GDD) as a blueprint for implementation. Prototypes were developed and adjusted based on feedback. In production, assets were created, and the game was coded and integrated for functionality. The testing stage focused on internal testing, including alpha testing to assess functionality, usability, and content accuracy. The beta stage involves external testing, focusing on refining prototypes. Beta testing can be conducted as either a closed beta, involving invited participants, or an open beta, open to registered users; this study adopts closed beta testing. Respondents evaluated user interactions using the System Usability Scale (SUS) to measure intuitiveness and user experience. The SUS comprises ten questions with five answer options, as detailed in table 1.

Table 1. System usability scale questions

No	Question
1	I find it easy to play this Javanese language game.
2	I find elements such as sound, images, and colors distracting while playing.
3	I feel that all interface elements, such as menus and buttons, function well.
4	I need assistance when playing this Javanese language game.
5	I feel that my knowledge of the Javanese language has improved with the help of this game.
6	I find the questions and explanations difficult to understand.
7	I feel that the material in this Javanese language game is easy to understand.
8	I feel the use of the Javanese language in this game is inconsistent.
9	I feel that the features in this Javanese language game are adequate.
10	This Javanese language game's interface and game flow are confusing to me.

Test data was analyzed to calculate the SUS score, reflecting users' perceived usability of the game. equation (1) shows the calculation method. The final score was averaged and categorized into acceptability range, adjective ratings, and grade scale, as shown in figure 2. As shown in figure 2, the SUS Score is interpreted through three key categories: acceptability ranges, grade scales, and adjective ratings. Acceptability ranges reflect users' perceptions, classifying the system as "acceptable," "high marginal," "low marginal," or "not acceptable." The grade scale assigns letter grades (A, B, C, D, F), with "A" indicating excellent usability and "F" indicating poor usability. Adjective ratings convert numerical scores into descriptive terms like "best imaginable," "excellent," "good," "OK," "poor," or "worst imaginable," summarizing overall user perception. These categories help clarify system usability and areas for improvement (Ependi et al., 2019) .

$$SUS\ SCORE = \big((R1-1)+(5-R2)+(R3-1)+(5-R4)+(R5-1) + (5-R6)+(R7-1)+(5-R8)+(R9-1)+(5-R10)\big) * 2.5 \quad (1)$$

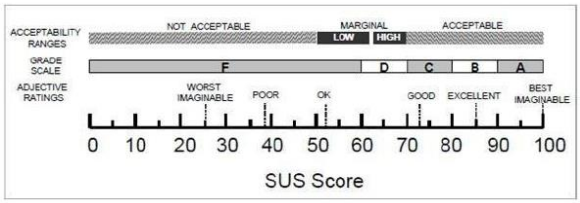

Figure 2. SUS score category

In the release stage, the game was prepared for public distribution. Post-release strategies included ongoing updates and user support to maintain engagement and ensure the game's continued effectiveness in promoting Javanese language and cultural learning. This structured approach ensures that the *Sinau* game is developed systematically, thoroughly evaluated, and ready to support early childhood Javanese learning.

RESULT AND DISCUSSION

Result

During the initiation stage of the GDLC for the *Sinau* game, the process of creating the game's concept involves identifying and analyzing the research problem, conducting observations, and reviewing literature from similar studies to determine the best method to use. Observations were conducted at SD Negeri Candirejo and SD Negeri Selomulyo, both located in Ngaglik, Sleman, Yogyakarta. The observations were carried out with second-grade students, along with interviews with teachers and the principal. Based on the observations, the children communicated with their friends using a mix of Indonesian and Javanese languages. For example: "*Kamu belum **mangan** kah*?" (Haven't you eaten yet?). According to interviews with the teachers and principal, it was revealed that the students were not yet able to use Javanese properly and preferred to use Indonesian, and they were also unable to distinguish between Javanese *Kromo* and *Ngoko*. Although the observation was conducted on second-grade elementary students, this game is designed for early childhood and can be used as a Javanese language learning tool both at school and at home.

This study employed the guided discovery learning method. By allowing children to learn from their mistakes through trial and error, this increases their engagement in the learning process. This learning method's implementation starts with identifying students' needs, locating familiar materials and early childhood problems, assisting students in clarifying tasks or

problems to learn, offering opportunities for discovery through step-by-step game guidance, and finally rewarding students when they complete their tasks with a game score.

In the pre-production stage, it was determined that the *Sinau* game's genre is educational, with a focus on Javanese language learning. Gameplay is implemented by presenting quizzes in the form of questions and visual aids. Questions are presented in Indonesian alongside relevant illustrations, enabling children to associate terms with their Javanese equivalents. Each question is accompanied by a pronunciation of the respective Javanese term. By targeting specific cognitive and linguistic skills, this game aims to address foundational challenges in Javanese language acquisition, as detailed in Table 2.

Table 2. The vocabulary subject of each level

Level	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Subjects	Numbers	Family members	Items outside of the house	Foods	Animals	Body parts	Verbs	Sentences (final quiz)

Table 2 outlines the vocabulary subjects organized across eight levels, representing a gradual progression in language learning complexity. Level 1 introduces basic numbers, forming the foundation for further learning. Level 2 focuses on family members, fostering familiarity with relational terms. Level 3 expands vocabulary to items outside the house, encouraging the expansion of children's Javanese vocabulary about items. Level 4 covers food-related terms, connecting to daily experiences. Level 5 introduces animals, improving descriptive skills. Level 6 shifts to body parts, essential for basic communication. Level 7 incorporates verbs, promoting action-based language use. Finally, Level 8 integrates all previous knowledge through sentences in a final quiz, reinforcing comprehensive learning. The storyboard is then created to provide a visual representation of the game's flow, which consists of a series of sketches or images arranged in sequence to outline the key scenes, as illustrated in Figure 3. The first image is a game storyboard for level 1 (numbers vocabulary), while the second is a storyboard for level 4 (foods vocabulary).

Figure 3. The examples of a game storyboard

During the production stage, the game development process involved creating assets, writing the code, and integrating all components into a cohesive system. The assets used for voice and visual elements were either copyright-free or specifically commissioned by the researcher to maintain originality and authenticity. The Sinau game is implemented as follows. Figure 4 shows the game's implementation of levels 1 and 2. Level 1 focuses on teaching children about numbers, with the instructor in the game explaining the numbers in Javanese

before giving the pupils a quiz. Level 2 focuses on learning family member terms, with a character named Budi introducing his family and guiding players through a related quiz to enhance vocabulary.

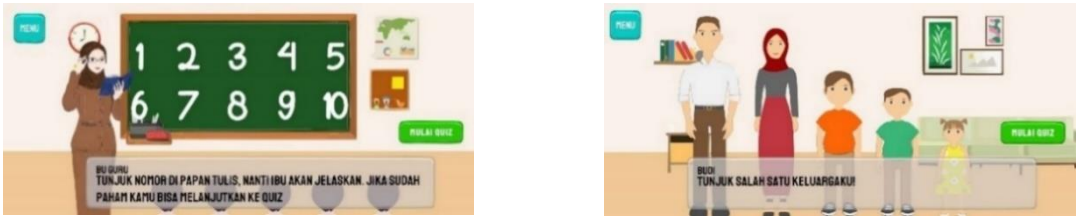

Figure 4. The game implementation view of levels 1 and 2

Figure 5. The game implementation view of levels 3 and 4

Figure 5 showcases the implementation of game levels 3 and 4. In level 3, Budi introduces common outdoor items in Javanese, followed by a quiz for the game user. In level 4, Budi and his family plan a zoo visit, first stopping for lunch at a restaurant. Budi introduces a dish from the restaurant in Javanese, followed by a quiz, which players match by dragging the Javanese word to the correct food. Figure 6 shows the fifth and sixth game level's implementation. In level 5, Budi and his family are visiting the zoo. Budi explains the animal name in Javanese, and then he administers a quiz where players match animal sounds to the correct animals. In level 6, Budi presents body parts in Javanese and administers a quiz to the game user.

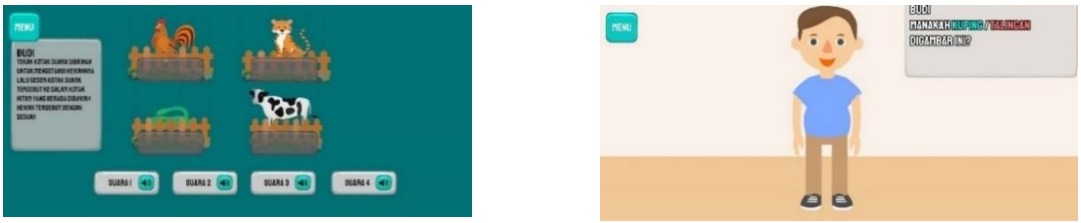

Figure 6. The game implementation view of levels 5 and 6

Figure 7. The game implementation view of levels 7 and 8

Levels 7 and 8 of the game, shown in figure 7, introduce the concept of *unggah-ungguh*. Level 7 uses color-coded verbs: blue for *Ngoko*, used with peers or younger people, and red for *Kromo*, used with older individuals, teaching politeness levels in Javanese. Level 8 features a final quiz with complete sentences to assess progress, incorporating the *unggah-ungguh*

concept. Students earn 10 points for each correct answer, with a total score of up to 100, based on 10 questions.

During the testing phase, the alpha testing approach is utilized to find errors in the game application. Success criteria included whether each feature functioned correctly, with any errors documented for correction. Feedback was collected to evaluate user engagement. Errors were addressed to ensure the game's functionality and maintain user engagement with the story. Table 3 summarizes the alpha testing results, evaluating the game across three criteria. Operational performance confirmed smooth gameplay without technical issues. User interface (UI) usability was validated, ensuring interactivity and ease of use. Content accuracy testing verified correct Javanese vocabulary with no typographical errors, aligning with the game's educational goals. All criteria were successfully met.

Table 3. Alpha testing

No	Criteria	Output	Result Test	
			Accept	Decline
1	Operational performance	Game running smoothly	✓	-
2	User interface (UI) usability	UI interactable	✓	-
3	Content accuracy	No typo and incorrect Javanese word.	✓	-

Beta testing, conducted during the beta stage, involved third-party testers. This closed beta session, held on June 14, 2024, at SD Negeri Selomulyo with second-grade students and teachers, assessed the game's performance and educational effectiveness. Feedback gathered from testers highlighted areas for improvement, and the testing process was documented visually in Figure 8.

Figure 8. Students test the game

After playing the game, testers evaluated it using the System Usability Scale (SUS) questionnaire, as shown in table 1. The SUS results, presented in Figure 9, yielded a score of 74.17, indicating that the *Sinau* game is "ACCEPTABLE," with an adjective rating at the GOOD level. This score is above the average SUS score of 68, suggesting that the game's usability performs better than average.

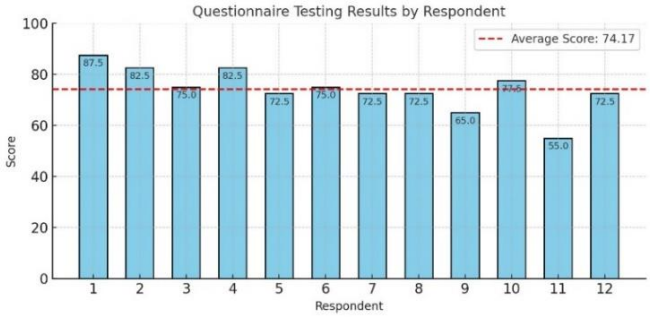

Figure 9. The questionnaire testing results

The release stage marks the final phase of the GDLC method, where the application is launched in its completed form. Table 4 presents the official release of "*Sinau*: Javanese Language Learning Game" as version V.1.2, reflecting the culmination of all development stages initiation, pre-production, production, testing, and beta ensuring the application is fully functional and optimized for enhancing early childhood Javanese language learning.

Table 4. The application release version

Name	Version
Sinau: Javanese language learning game	V.1.2

Discussion

The development of the *Sinau* game followed a structured process from initiation to beta stage, ensuring alignment with educational goals. In the initiation stage, the need to address the gap in language proficiency among early childhood learners, who often mix Indonesian and Javanese, was identified as a key challenge. This led to the creation of an interactive game designed to help children differentiate the two languages, focusing on vocabulary and Javanese *unggah-ungguh* (manners).

In the pre-production phase, the selection of teaching method and game genre, along with prototyping, was driven by the need to create an interactive, game-based platform that could provide immediate feedback through quizzes. This allows learners to practice vocabulary, sentence structure, and comprehension in Javanese, all while fostering an understanding of cultural context. The use of visual aids and pronunciation helps bridge gaps in learning, offering multimodal learning experiences that cater to diverse learning styles. A guided discovery approach was selected in order for children to engage in hands-on, trial-and-error learning, fostering both independent exploration and a scaffolded learning environment.

The Unity Game Engine was used in the production stage for its compatibility with the required assets. The development team ensured that all game elements, including sound, voice acting, music, and art, were copyright-free to avoid legal issues. During this phase, internal alpha testing was conducted to assess the game's functionality, usability, and educational content. In the beta stage, external testing through closed beta allowed a broader group of users, including students and teachers, to provide feedback on the game. The SUS was used to measure the game's intuitiveness, learnability, and overall user experience (Fergo & Ratnasari, 2023), resulting in a score of 74.17, according to SUS category from Ependi et al. (2019) and Sasmito et al., (2019) that this game was indicated well-received and user-friendly. Further suggestions for enhancement, such as additional levels to extend learning opportunities, were noted.

The *Sinau* game proved effective in improving Javanese language skills through interactive learning, aligned with Simamora et al. (2019), who found that learner-centered methods increase self-efficacy. Comparing *Sinau* with similar games, the *Dinggo* game focused on teaching Javanese *Ngoko* and *Kromo* vocabulary using the waterfall development method, achieving a user agreement score of 91.8% (Khoirunnisa & Huda, 2023). However, it was limited to vocabulary acquisition and did not address the use of language in context or teach *unggah-ungguh*. Similarly, the *Sinau Bareng Miko* game used the Multimedia Development Life Cycle (MDLC) method and achieved an 82% user acceptance rate (Firmandasari et al., 2020). It incorporated Javanese-based questions but lacked a detailed pronunciation feature, which is present in the *Sinau* game. The *Kenmriki* game utilized MDLC, focused on teaching manners through Javanese *Kromo,* but it only discussed the Javanese language learning display template within the game application, without providing any details on the learning content (Puspita, 2022). Testing showed that 62.5% strongly agreed, and 37.5% agreed that it aids Javanese *Kromo* learning.

In contrast, the *Sinau* game incorporates *unggah-ungguh* based on the context of who the subject is in the given sentence (rather than just learning vocabulary), allowing learners to learn manners indirectly while communicating. Additionally, while the *Sinau Bareng Miko* game boasts an audio feature, it doesn't explicitly mention the inclusion of a feature for Javanese pronunciation, which is present in this *Sinau* game. By addressing both linguistic and cultural aspects of Javanese, thebila *Sinau* game offers a more comprehensive learning experience.

The success of the *Sinau* game underscores the effectiveness of the GDLC, supporting iterative development for higher usability and educational outcomes, as noted by Saputra et al. (2022). The feedback-driven process throughout the GDLC stages ensures the game meets its educational goals and provides a foundation for future developments in language learning games.

CONCLUSION

The *Sinau* game was developed to address the decline in Javanese language use among younger generations, ensuring its preservation and cultural continuity. Designed for early childhood learners (ages 4–8), the game focuses on teaching vocabulary, pronunciation, and *unggah-ungguh* (*Kromo* and *Ngoko*) within appropriate social contexts through an interactive and engaging platform. Testing involving elementary students and teachers demonstrated its potential as an effective educational tool, with a usability score of 74.17 on the SUS, indicating general acceptance. By incorporating cultural elements (*unggah-ungguh*) and pronunciation features, the game enhances language learning while fostering ethical communication skills in alignment with Javanese traditions. These findings suggest that *Sinau* supports the preservation of linguistic and cultural heritage while providing a scalable framework for future research on improving early childhood education and adapting similar tools to other regional languages.

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