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Development of Rhino-Themed Mobile Learning for Critical Thinking Skills of Ecosystem Concepts for 5th Grade Students

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Abstract

Learning media plays an important role in supporting the success of the learning process, especially in developing students' critical thinking skills. This study aimed to develop mobile learning media with the theme of the One-Horned Rhinoceros, an endemic animal typical of Ujung Kulon National Park, as a contextual learning tool to improve elementary school students' critical thinking skills in ecosystem material. The method used is Research and Development (R&D) with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The study results showed that the media was developed to analyze student needs and local context through an interactive design process, expert validation, and classroom trials and evaluations. The validation results showed a feasibility level of 91% (very good category). The effectiveness of the media is reflected in the N-Gain value of 0.7171 (high category). The responses of teachers and students to the media were also very positive, 87% and 98.7% respectively. In conclusion, the product developed is feasible and effective and can improve students' critical thinking skills.

Keywords: Critical Thinking, Mobile Learning, One-horned Rhinoceros

INTRODUCTION

Critical thinking skills are an important competency in 21st-century education, but in reality, many elementary school students cannot relate subject matter to real life. One of the causes is the use of learning media that is less interactive and not contextual. Learning media that is still one-way makes students passive and makes it difficult to develop analytical skills (Sutiawan *et al.,* 2022; Boari et al., 2023; Fauziah et al., 2024; Maesaroh, 2024). On the other hand, contextual learning that links knowledge to the surrounding environment has been shown to improve student understanding (Shabartini *et al.,* 2023; Suryawati et al., 2017; Budiman et al., 2021; Burwell et al., 2004; Chang, 2006; Hudson & Whisler, 2007), but is still rarely utilized optimally, especially with a technology-based approach.

The use of technology also plays an important role in learning Natural and Social Sciences subjects. One of the topics in Natural and Social Sciences that requires in-depth understanding and critical thinking skills is Ecosystems. Therefore, technology-based learning media can be an effective solution to develop students' critical thinking skills (Purwaningsih *et al.,* 2021).

Critical thinking skills are needed in today's digital era, where information is easily available but needs to be analyzed carefully (Rusdin *et al.,* 2024). This skill includes understanding, evaluating, and analyzing information logically. In the learning process,

critical thinking helps students become more analytical about the material being studied and encourages them to find better solutions to problems (Darling-Hammond *et al.,* 2020; Keiler, 2018). This ability is included in important life skills and needs to be developed through education at all levels.

Several studies have shown that mobile learning can improve student engagement and learning outcomes (Cahyani *et al.,* 2022). However, most existing mobile learning applications have not integrated local wisdom and environmental issues, even though both are important for fostering ecological awareness from an early age (Leksono *et al.,* 2015; Nikmatullah *et al.,* 2015). The theme of the one-horned rhinoceros as a protected endangered species in Indonesia is rarely raised in learning media, even though it has the potential to teach ecosystem concepts contextually while introducing conservation to students.

Observations in class 5 at one of the integrated Islamic elementary schools Cilegon, Banten showed that students were less enthusiastic in learning ecosystem material and still had minimal understanding regarding the conservation of endangered species. This shows the need for developing thematically relevant, interesting media that encourages active interaction. Until now, the school has not utilized mobile learning technology in its learning process, so the potential of digital media to improve critical thinking skills has not been optimally utilized.

This study aims to develop interactive and contextual mobile learning-based learning media with the theme of the one-horned rhinoceros. This media is designed to facilitate students in understanding the concept of ecosystems while improving their critical thinking skills. The development is based on constructivism theory (Piaget & Vygotsky), contextual learning theory, and Mayer's multimedia theory, which encourages active student involvement through the use of text, images, audio, and video in an integrated manner.

The development of this application is expected to not only solve students' low critical thinking skills but also strengthen environmental and local wisdom-based education. The novelty of this media lies in the integration of local themes (one-horned rhinoceros), contextual approaches, and digital technology designed according to the characteristics and needs of elementary school students. This research is expected to positively contribute to creating a more meaningful, adaptive, and sustainable learning model.

METHOD

The research method used is research and development (Research & Development or R&D) with the ADDIE model, which includes five stages: Analysis, Design, Development, Implementation, and Evaluation. This ADDIE development model is a reference in producing

effective products because the stages are relatively simple, and each stage includes components that are explained in detail.

The following is a description of the stages in the ADDIE model.

1. Analysis, namely conducting a needs analysis. Identifying problems, identifying products that are following the target, and thinking about the product to be developed.
2. Design, the design stage is the stage of designing the product concept to be developed.
3. Development, development is the process of turning a design into reality.
4. Implementation is a product trial, which is a real step to implementing our product.
5. Evaluation is the process of seeing whether the product created is successful following initial expectations.

This research and development was conducted at one of the integrated Islamic elementary schools, Cilegon, Banten, class 5 of the 2024/2025 academic year, located at Pondok Cilegon Indah Block D70 Cibeber, Cilegon, Banten. The research activities were carried out in the even semester of the 2024/2025 academic year, namely in January - February 2025. The trial subjects in this study were students of class VB at SDIT Raudhatul Jannah in the even semester of the 2024/2025 academic year. A limited trial to determine the readability response of the development product in the form of Mobile learning was carried out on 28 students.

Data collection techniques in this development research include interviews, questionnaires, and learning outcome tests. Interviews were conducted with teachers and students of 5th grade at one of the integrated Islamic elementary schools Cilegon, Banten, to obtain initial information about the learning process in the classroom, including the methods, media, and learning resources used. The questionnaire was used to obtain product validation data from media experts, material experts, and responses from teachers and students as users. The type of questionnaire used was a closed questionnaire, which was designed based on aspects of content, presentation, language, and graphics referring to the 2014 BSNP standards, then modified according to the research objectives. The instrument was arranged in a grid, and a Likert scale was used, with statements in the form of positive items. Before being used, the questionnaire was validated by experts through judgment, then revised according to suggestions and used to assess the feasibility of the product. Learning outcome tests were conducted before and after using one-horned rhinoceros-themed mobile learning media to measure its effect on students' critical thinking skills.

RESULTS AND DISCUSSION

Analysis

The analysis stage in developing mobile learning media with the theme of the One-Horned Rhinoceros begins with identifying the needs of students, curriculum, and user characteristics. The researcher interviewed 5th grade teachers at one of the integrated Islamic elementary schools Cilegon, Banten to gather information about current learning conditions. The interviews showed that although the school already had adequate printed learning facilities, such as textbooks and accompanying books, the use of digital media was still limited to passive videos and slides that did not support direct interaction. No interactive learning media was available to invite students to explore the material actively and contextually. This is the basis for the need to develop more dynamic and enjoyable mobile learning media.

In addition, curriculum analysis shows that one of the integrated Islamic elementary schools, Cilegon, Banten implements the Merdeka Curriculum, which emphasizes project-based, contextual learning and developing critical thinking skills. For 5th grade science subjects, learning outcomes include understanding the ecosystem's relationship between biotic and abiotic components and the importance of environmental balance. Therefore, the learning media developed must stimulate students to think analytically and reflectively about the environmental phenomena they are studying.

No less important is the analysis of student characteristics. Based on the observations and discussions with teachers, it is known that students are highly interested in technology, and most are accustomed to using digital devices such as smartphones. According to Piaget, they are at the stage of concrete operational cognitive development, so they need media that presents information visually, realistically, and easily manipulated. The combination of learning needs, curriculum demands, and student characteristics is what directs media development towards mobile learning based on local themes, namely the preservation of the one-horned rhinoceros.

Design

After the learning needs and characteristics are identified, the design stage begins by compiling the media content and appearance design. The design is done by compiling a flowchart and storyboard as the main guideline in developing the content and user interaction flow. The media is designed as an interactive educational game, combining adventure narrative elements with learning activities, such as quizzes, drag and drop, and critical answer selection. The material included contains factual knowledge and trains students in analyzing cause and effect and making decisions based on conceptual understanding.

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We also developed instruments to assess the media's validity, practicality, and effectiveness. The instruments cover aspects of content suitability, language, presentation, and graphics based on BSNP standards. Questionnaires were prepared to be validated by media experts, material experts, and filled out by teachers and students after the trial. All media designs were designed using Canva for visualization and Articulate Storyline to create web-based and offline digital interactions so they can be used on various devices.

This design also emphasizes the preparation of narrative content. The context of children's adventures exploring the Ujung Kulon ecosystem with the one-horned rhinoceros character is a special attraction for students. The story is designed to alternate with activities, such as answering critical questions. This strategy aims to maintain attention and increase students' emotional involvement during learning.

Development

The development stage begins with implementing the design plan into a real product. Visuals, audio, text, and navigation are arranged in an integrated manner using Articulate Storyline. Researchers develop all components in the form of a simple HTML5-based application to be accessed offline or online. The initial product is then consulted with two experts: a media expert and a material expert.

The validation results from media experts show that the media has an attractive appearance, easy-to-understand navigation, and appropriate color composition, fonts, and layout. The average value given by media experts is 4.53 or 91%, including the category "Very Good." The validation results obtained from media experts can be seen in Figure 1.

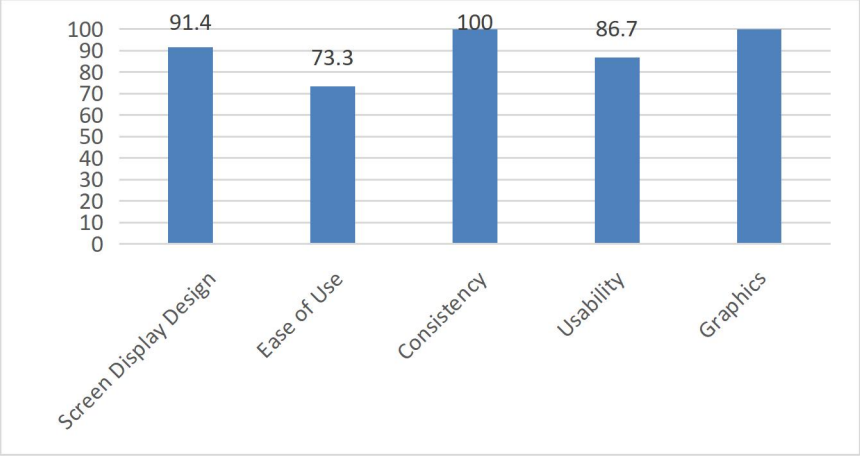

Figure 1. Media Expert Validation Assessment Results

Meanwhile, the validation results by material experts showed that the material's content was in line with learning outcomes, the language was easy for children to understand, and the activities encouraged critical thinking. The average value obtained was 4.57 or 92%. Some of

the inputs provided included adding instructions for use and the order of game visualizations to make them more logical and narratively coherent. The validation results obtained from media experts can be seen in Figure 2.

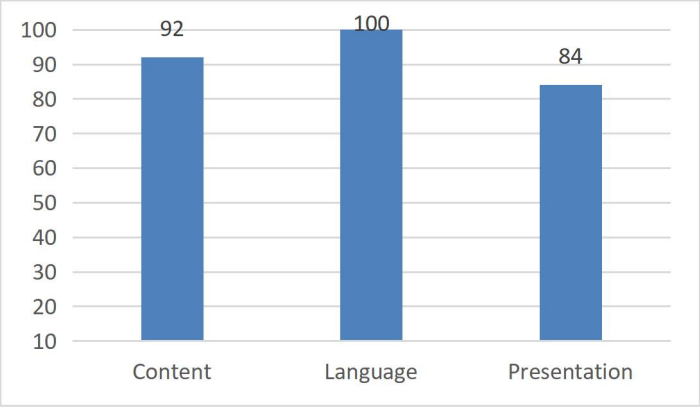

Figure 2. Results of Material Expert Validation Assessment

Suggestions from experts were used as the basis for product revisions before conducting limited trials. Improvements included adding a pause button to the audio, more vivid illustrations, and adjusting the layout of game activities to match the storyline. This stage is very important in ensuring that the final product is high quality and ready to be used in real learning.

Implementation

The implementation was carried out as a limited trial at one of the integrated Islamic elementary schools in Cilegon, Banten, on February 17–20, 2025. This activity involved 28 5th grade students. Before learning began, students were given a pretest with 10 questions based on critical thinking indicators. After that, they took part in learning using the developed mobile learning media, and then a posttest was carried out with the same questions to measure the improvement in learning outcomes. A comparison of the pretest and posttest can be seen in Figure 3.

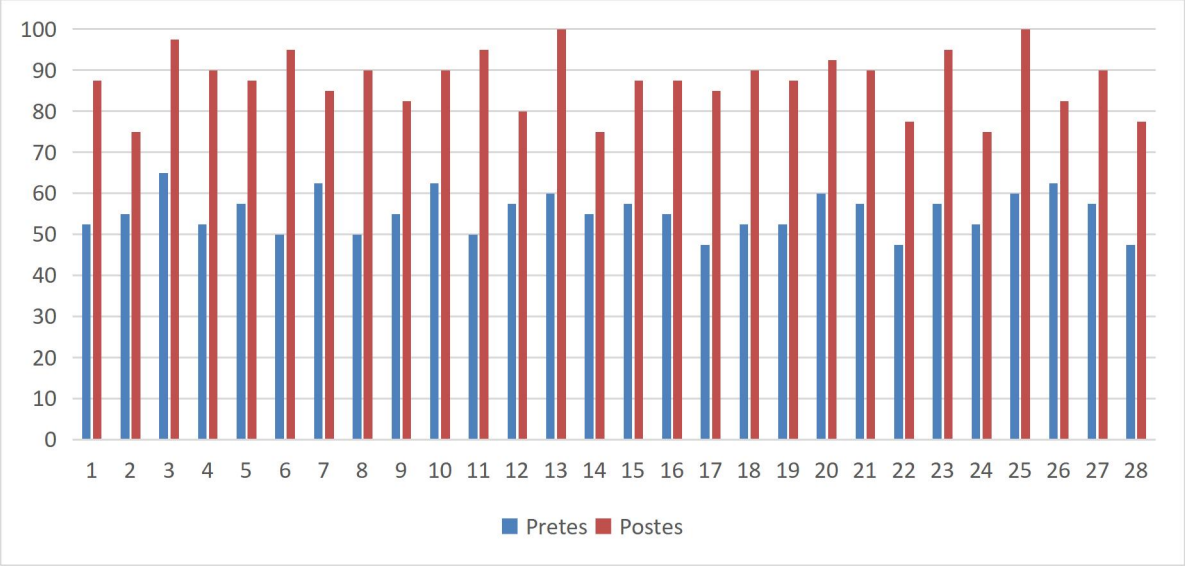

Figure 3. Critical Thinking Test Results

The pretest results showed that the average student score was 55.45. After using the media, the posttest score increased to an average of 87.41. This increase was analyzed using the N-Gain formula, and a score of 0.7171 (71.71%) was produced, which is included in the high category. This means that learning with mobile learning media has proven effective in improving students' critical thinking skills.

In addition to the learning outcome test, researchers also distributed questionnaires to students and teachers. As a result, students gave an average rating of 4.93 with a percentage of 98.70%, including the "very good" category. They stated that the media was easy to use interesting, helped them understand the material, and encouraged enthusiasm for learning. Teachers also gave an average score of 4.35 or 87%, and said that this media helped explain concepts, increased student motivation, and was suitable for flexible and contextual Independent Curriculum learning.

Evaluation

The evaluation stage is carried out to assess the quality and effectiveness of the overall media product. Formative evaluation is carried out from the development stage to post-implementation. The review includes expert assessments, user responses, student learning outcomes, and media effectiveness in achieving learning objectives. From all the data collected, the mobile learning media with the One-Horned Rhino theme is considered very feasible, practical, and effective in supporting technology-based science learning.

The advantages of this media are not only in its attractive visual appearance but also in its learning approach that combines local wisdom values and interactive learning experiences. The flexibility of offline and online use is also an important point that allows this

media to be used in various school conditions. The final evaluation showed that this media is worthy of being recommended for further development and wider use in various elementary schools.

CONCLUSION

Based on the research and development results, it can be concluded that the mobile learning media with the theme of the One-Horned Rhinoceros has been successfully developed systematically using the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. This media is designed to improve students' critical thinking skills on ecosystem material with a contextual and interactive approach. The development process utilizes software such as Canva and Articulate Storyline to produce media that is easy to use, attractive, and follows the characteristics of elementary school students who are already familiar with the technology.

The feasibility of the media has been proven through a validation process by media experts and material experts. Media experts assessed with an average score of 4.53 or 91%, while material experts gave an average of 4.57 or 92%. Both are included in the very good category, reflecting that this media meets content, language, graphics, and ease of use. Revisions were made based on validator suggestions, such as adding instructions for use and rearranging the game flow to be more communicative. Thus, the media is declared feasible to be implemented in learning.

The effectiveness of the media was tested through a pretest and posttest of critical thinking. The average student score increased from 55.45 in the pretest to 87.41 in the posttest. The N-Gain value obtained was 0.7171 or 71.71%, which is classified as high. This shows that mobile learning media has proven effective in improving students' critical thinking skills, especially in concluding information, constructing logical arguments, and making decisions based on facts and consequences.

Responses from users, both students and teachers, showed very positive acceptance. Students gave an average rating of 4.93 with a percentage of 98.70%, and teachers gave an average rating of 4.35 with a percentage of 87%. Students felt that the media really helped them understand the material in a fun and easily accessible way. Teachers also stated that this media supports the science learning process, which requires an interactive and contextual approach per the Merdeka Curriculum. Thus, the mobile learning media with the One-Horned Rhino theme has proven to be feasible and effective has received positive responses from all parties, and can be used as an alternative technology-based learning media that supports the formation of critical thinking skills in elementary schools.

REFERENCES

Boari, Y., Megavitry, R., Pattiasina, P. J., Ramdani, H. T., & Munandar, H. (2023). The Analysis Of Effectiveness Of Mobile Learning Media Usage In Train Students' Critical Thinking Skills. Mudir: Jurnal Manajemen Pendidikan, 5(1), 172-177.

Budiman, A., Samani, M., & Setyawan, W. H. (2021). The Development of Direct-Contextual Learning: A New Model on Higher Education. International Journal of Higher Education, 10(2), 15-26.

Burwell, R. D., Saddoris, M. P., Bucci, D. J., & Wiig, K. A. (2004). Corticohippocampal contributions to spatial and contextual learning. Journal of Neuroscience, 24(15), 3826-3836.

Cahyani, A., Hanafi, S., & Nulhakim, L. (2022). Efektivitas Media Pembelajaran Berbasis Android Untuk Meningkatkan Hasil Belajar Peserta Didik Kelas Viii Smpn 22 Kota Serang. *Biodidaktika: Jurnal Biologi dan Pembelajarannya*, *17*(2).

Chang, E. (2006). Interactive experiences and contextual learning in museums. Studies in Art Education, 47(2), 170-186.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. Applied Developmental Science, 24(2), 97–140.https://doi.org/10.1080/10888691.2018.1537791

Fauziah, S. A., Aini, Z. N., Zahra, B. S., & Agessi, Y. A. P. (2024). From Passive to Proactive: Transforming Geography Education through Problem-Based Learning to Foster Critical Thought. Future Space: Studies in Geo-Education, 1(4), 407-421.

Hudson, C. C., & Whisler, V. R. (2007). Contextual teaching and learning for practitioners. Journal of Systemics, Cybernetics and Informatics, 6(4), 54-58.

Keiler, L. S. (2018). Teachers' roles and identities in student-centered classrooms. *International journal of STEM education*, *5*, 1-20.

Leksono, S. M., Syachruroji, A., & Marianingsih, P. (2015). Pengembangan bahan ajar biologi konservasi berbasis etnopedagogi. *Jurnal Kependidikan: Penelitian Inovasi Pembelajaran*, *45*(2), 128230.

Meisaroh, S. (2024). Development of Android-Based Interactive Mobile Learning with Guided Inquiry Models to Improve Higher Order Thinking Skills on Light Wave Material. Jurnal Penelitian Pendidikan IPA, 10(2), 522-529.

Nikmatullah, M., Leksono, SM, Marianingsih, P., Biology, JP, Sultan, U., & Tirtayasa, A. (2015). Diversity of Zingiberaceae as content of biodiversity material in Pandeglang High School. Biodidactics, 10(2), 51–60.

Purwaningsih, W., & Wangid, M. N. (2021). Improving students' critical thinking skills using Time Bar Media in Mathemathics learning in the third grade primary school. *Jurnal Prima Edukasia*, *9*(2), 248-260.

Rusdin, D., Mukminatien, N., Suryati, N., & Laksmi, ED (2024). Critical thinking in the AI era: An exploration of EFL students' perceptions, benefits, and limitations. Cogent Education, 11(1), 2290342.https://doi.org/10.1080/2331186X.2023.2290342

Shabartini, D. N., Hidayat, S., Jamaludin, U., & Leksono, S. M. (2023). Konsep Pendidikan Ki Hadjar Dewantara Dalam Penanaman Nilai-Nilai Multikultural Untuk Siswa Sekolah Dasar. *Jurnal Elementaria Edukasia*, *6*(2), 964-973.

Suryawati, Evi, and Kamisah Osman. "Contextual learning: Innovative approach towards the development of students' scientific attitude and natural science performance." Eurasia Journal of mathematics, science and technology education 14.1 (2017): 61-76.

Sutiawan, A., Sudadio, & Nulhakim, L. (2022). Application of Role Playing Learning Model in Social Studies Subject of Heroic Figures to Improve Learning Outcomes and Learning Motivation of Students of Sentul Jaya 2 Elementary School. PREDICTION: National Education Profession, 2(2), 67–82.