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# DEVELOPMENT OF HISTORIA TRIVIA LEARNING MEDIA TO IMPROVE DIGITAL LITERACY AND COGNITIVE LEARNING OUTCOMES IN HISTORY OF GRADE XI STUDENTS AT PILANGKENCENG STATE HIGH SCHOOL

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## Abstract

This research focuses on the development of Historia Trivia as a learning medium and examines its feasibility and effectiveness in enhancing digital literacy skills and cognitive learning outcomes in history among eleventh-grade students at Pilangkenceng State Senior High School. The study employs a Research and Development (R&D) approach using the ADDIE model, which consists of the stages of Analysis, Design, Development, Implementation, and Evaluation. Data were collected through questionnaires administered to teachers and students, validation instruments completed by media and subject-matter experts, and cognitive tests and assignments in the form of pretests and posttests. The findings reveal that the Historia Trivia learning media is highly feasible, achieving a validation score of 90%, and has been shown to improve students' digital literacy and learning outcomes significantly. Students' average cognitive scores increased by 17.5 points, rising from 67.5 to 85. Additionally, scores on digital literacy assignments improved by 37.5 points, from 45 to 82.5. Overall, the study concludes that the developed learning media are both successful and effective in supporting students' digital literacy development and comprehension of historical content.

Keywords: Learning media; Digital literacy; Cognitive learning outcomes; History learning; Development.

## INTRODUCTION

In the era of globalization and digitalization, education plays a strategic role in preparing students to face increasingly complex future challenges. Rapid advancements in information technology have significantly influenced various aspects of life, including education, and have intensified the demand for 21st-century competencies such as critical thinking, creativity, communication, collaboration, and digital literacy (Tohani, E., & Aulia, 2022). Consequently, learning practices must adapt to technological developments to remain relevant and effective (Isaeva, Karasartova, Dznunusnalieva, Mirzoeva, & Mokliuk, 2025).

Within this context, history education holds an essential role in shaping national identity and fostering students' critical awareness in responding to contemporary issues. History learning does not merely present chronological accounts of past events but also conveys values of struggle, tolerance, and socio-political dynamics that are relevant to present and future societal developments (Soedjatmoko, 2013). Therefore, history as a subject must continuously transform to address the challenges of the digital era.

Despite its importance, history learning at the senior high school level in Indonesia is still frequently perceived as monotonous and less engaging. Instructional practices often emphasize memorization rather than active learning and critical analysis (Andayani & Gunawan, 2025). Most students consider history lessons uninteresting due to repetitive teaching methods that focus primarily on factual recall. This condition suggests a gap between the objectives of history education and current classroom practices (Labibatussolihah, Adriani, Fathiraini, & Sumirat, 2022).

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One key factor contributing to this issue is the limited integration of digital learning media. Digital literacy has become a fundamental skill in 21st-century education (Audrin & Audrin, 2022). Unesco defines digital literacy as the ability to access, understand, evaluate, and use information from digital platforms effectively. However, the level of digital literacy among Indonesian students remains relatively low {Formatting Citation}. A national survey conducted by the Ministry of Communication and Information Technology reported that 51.5% of secondary school graduates or lower scored below the national average in digital literacy (Kemenkominfo, 2021).

In history education, digital literacy extends beyond the ability to access online historical sources. It also involves evaluating information credibility, interpreting historical narratives critically, and synthesizing information from diverse digital sources (Hajdarovic, 2023). AlRamadhan (2020) emphasize that digital literacy skills can be effectively developed through pedagogically designed digital learning media that promote interaction and critical engagement.

Nevertheless, the utilization of digital media in history learning remains suboptimal. Data from the Ministry of Education, Culture, Research, and Technology indicate that more than 60% of secondary school teachers have not optimally integrated digital media into their instructional practices (Kemendikbudristek, 2023). This limitation contributes to low student engagement and insufficient development of digital literacy skills, particularly in history learning contexts (Fahruddin, Rosidi, Fitroh, Darsono, & Saefudin, 2024).

To address these challenges, the development of innovative and technology-based learning media is necessary. One approach that has gained attention is gamification, which refers to the integration of game elements into non-game contexts such as education. Gamification has been shown to enhance student motivation, engagement, and active participation in learning activities (Sikora, Chernykh, Shaforost, Danylyuk, & Chemerys, 2024). Ukgoda (2025) states that the use of game elements, including points, levels, challenges, and rewards, can foster a more engaging and enjoyable learning environment.

Based on these considerations, this study focuses on the development of a game-based learning medium entitled Historia Trivia. This interactive digital quiz game integrates historical content with game mechanics to support active learning and digital literacy development (Lai & Hu, 2025). The media is designed specifically for eleventh-grade students at SMA Negeri Pilangkenceng to provide an engaging alternative to conventional history instruction.

This study is significant as it contributes to improving the quality of history learning through an interactive and technology-based approach. The developed learning media is expected to enhance students' engagement, digital literacy skills, and cognitive learning outcomes in history. Furthermore, the findings of this study may serve as a reference for educators and researchers in developing and implementing digital learning media for history education at the secondary school level.

## RESEARCH METHOD

This study employed a Research and Development (R&D) design aimed at developing and evaluating an Android-based game learning media named Historia Trivia. The development process followed the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. This model was selected due to its systematic and flexible structure, making it suitable for instructional media development intended to improve learning quality and outcomes. The study was conducted at SMA Negeri Pilangkenceng, Madiun Regency. This site was chosen based on preliminary observations indicating low levels of students' digital literacy and cognitive learning outcomes in history subjects (Sugiyono, 2020). The participants consisted of three eleventh-grade classes (XI A1, XI A2, and XI C), involving a total of 100 students. Product testing was carried out through large-group trials involving all participants. ADDIE development model consists of five main stages: analysis, design, development, implementation, and evaluation. This model was chosen due to its systematic yet flexible nature, making it suitable for the development of instructional media aimed at improving the quality of learning processes and outcomes (Lee & Owens, 2004).

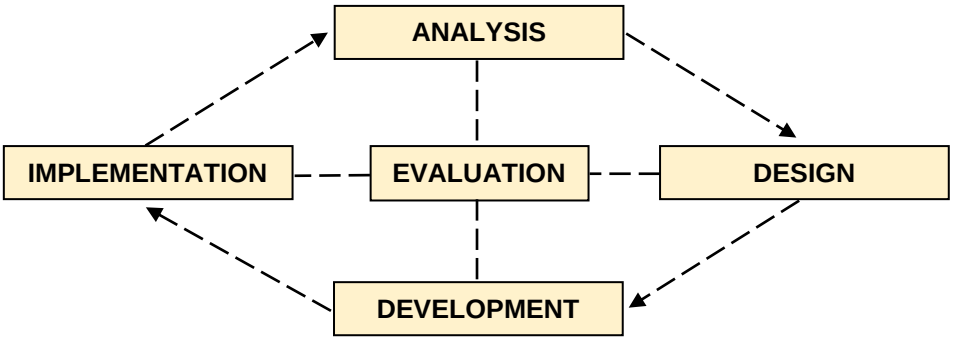


**Figure 1. Development Procedure**
(Lee & Owens, 2004)

The analysis stage involved identifying learning needs, student characteristics, learning objectives, and relevant historical content, which led to the selection of the topic on the Japanese occupation period in Indonesia. In the design stage, the structure of learning content, game mechanics, interface layout, and application features were planned, resulting in an application with a simple and attractive interface that included three main features: learning materials, quizzes, and score history. The development stage focused on creating a prototype of the Historia Trivia application using digital platforms such as Canva AI, Kodular.io, Google Sites, and Blackbox AI, encompassing layout design, content integration, quiz development, automated scoring system programming, and the preparation of research instruments. Finally, the implementation stage consisted of limited and large-group trials in which students were introduced to the application, independently downloaded and used the media, studied the materials, and completed quizzes within a 20-minute session, followed by an evaluation stage assessing media feasibility, practicality, and effectiveness based on expert validation, user responses, and learning outcome measurements (Lee & Owens, 2004).

Data were collected using questionnaires and assessment instruments, producing both quantitative and qualitative data. Quantitative data were obtained from Likert-scale questionnaires, pretest–posttest scores, and digital literacy assignment results. Qualitative data were collected through comments and suggestions from material experts, media experts, teachers, and students. The instruments included: (1) material expert validation questionnaires, (2) media expert validation questionnaires, (3) teacher response questionnaires, (4) student response questionnaires, (5) cognitive learning tests (pretest–posttest), and (6) digital literacy assignment rubrics. Questionnaire data were analyzed using a five-point Likert scale (1 = very invalid to 5 = very valid). The feasibility level of the learning media was determined by calculating the percentage of validity scores. The media was considered feasible if it reached a minimum validity level of 75%. Cognitive learning improvement was analyzed by comparing pretest and posttest scores. The learning media was considered effective if at least 75% of students showed improved cognitive learning outcomes. Digital literacy improvement was analyzed by comparing assignment scores before and after media implementation.

## RESULT AND DISCUSSION

### Result

The development of the Historia Trivia learning media followed the ADDIE instructional design model and resulted in a learning product that was ready for field testing. The main findings from each evaluation stage are presented below.

*Validity and feasibility of the learning media*

Material expert validation indicated that the learning media achieved feasibility scores ranging from 94% to 95%, categorized as very feasible, particularly in terms of content quality and curriculum alignment. The material experts confirmed that the historical content presented was relevant and consistent with the intended learning objectives, with an average score of 4 on a 4-point scale. Similarly, validation by educational media experts showed that the learning media was highly feasible, achieving an overall validation score of approximately 90%. In addition, evaluations conducted by two history teachers resulted in feasibility scores of 86% and 88%, both categorized as very feasible. A large-group trial involving 100 students produced a feasibility score of 91% based on student response questionnaires. Overall, the average feasibility scores across all evaluators including material experts, media experts, teachers, and students ranged between 90% and 95%, indicating that the Historia Trivia learning media met the criteria for validity and usability.

Table 1. Product Trial Result

| No. | Evaluation Subject | Feasibility Score |
|---|---|---|
| **1** | Material Expert Validation 1 | 94% |
| **2** | Material Expert Validation 2 | 92% |
| **3** | Media Expert Validation 1 | 90% |
| **4** | Media Expert Validation 2 | 93% |
| **5** | History Teacher Evaluation 1 | 86% |
| **6** | History Teacher Evaluation 2 | 88% |
| **7** | Large-Group Student Trial | 91% |

Based on the established questionnaire score conversion criteria, the Historia Trivia learning media was deemed valid and suitable for implementation. These findings also suggest that the learning media offers appropriate instructional content and an engaging interface design. Feedback from experts and teachers included recommendations for refining historical terminology, adding supplementary video resources, and expanding learning materials, which may serve as references for future product improvements.

*Improvement in Cognitive Learning Outcomes and Digital Literacy*

The effectiveness of the learning media in improving students' cognitive learning outcomes was evaluated using pretest and posttest assessments during the large-group trial. The results showed that the average pretest score was 67.5, while the average posttest score increased to 85, representing a gain of 17.5 points. These results indicate that Historia Trivia significantly enhanced students' cognitive learning outcomes in history.

Table 2. Cognitive Test Result

| Aspect | Minimum Score | Maximum Score | Mean Score |
|---|---|---|---|
| **Pretest** | 50 | 85 | 67.5 |
| **Posttest** | 70 | 100 | 85.0 |
| | **Gain** | | **17.5** |

The effectiveness of the learning media in enhancing students' digital literacy skills was assessed through a mind-mapping assignment integrated into the pretest–posttest design. The average score for the digital literacy task increased from 45 in the pretest to 82.5 in the posttest, with a gain of 37.5 points. These findings confirm that Historia Trivia significantly improved students' digital literacy skills in history learning.

Table 3. Digital Literacy Assignment Result

| Aspect | Minimum Score | Maximum Score | Mean Score |
|---|---|---|---|
| **Pretest** | 20 | 70 | 45 |
| **Posttest** | 70 | 95 | 82.5 |
| | **Gain** | | **37.5** |

Based on the cognitive test and digital literacy assignment results, it can be concluded that the Historia Trivia learning media not only improved students' cognitive learning outcomes but also successfully enhanced their digital literacy skills through interactive and contextual learning experiences (Clark & Mayer, 2016).

**Discussion**

The results of this study demonstrate that the development of the Historia Trivia learning media using the ADDIE instructional design model produced a valid, feasible, and effective digital learning product. High feasibility scores obtained from material experts, media experts, teachers, and students indicate that the application met essential instructional and technical quality standards (Ananda & Usmeldi, 2023). This finding aligns with previous studies emphasizing that systematic instructional design models such as ADDIE support the development of high-quality digital learning media by ensuring alignment between objectives, content, and evaluation (Senadheera, Ediriweera, & Rupasinghe, 2024).

The high material expert validation scores (above 90%) confirm that the historical content embedded in Historia Trivia was accurate, relevant, and consistent with curriculum standards. This result is crucial, as content accuracy and curriculum alignment are foundational elements in history education to avoid misconceptions and ensure meaningful learning (Firmansyah & Atmaja, 2025). The strong validation results suggest that the learning objectives related to the Japanese occupation period in Indonesia were successfully translated into clear and structured learning materials.

Similarly, the media expert evaluations indicated that Historia Trivia demonstrated strong usability, interface clarity, and visual appeal (Álvarez-Robles, Álvarez-Rodriguez, & Sandoval-Bringas, 2022). These aspects are essential in digital learning environments, as an intuitive interface and engaging design can reduce cognitive load and support learner motivation (Surbakti, Umboh, Pong, & Dara, 2024). The use of a simple yet attractive interface appears to have contributed positively to students' learning experiences, as reflected in the high feasibility scores from large-group trials.

Teacher evaluations further supported the practicality of the learning media in real classroom contexts. Scores above 85% indicate that history teachers perceived Historia Trivia as easy to implement and pedagogically appropriate (Serrano-Ausejo, 2025). Teachers' feedback regarding terminology refinement and material expansion reflects a constructive evaluation process, reinforcing the role of educators as critical evaluators in instructional media development (Molenda, 2015). Such feedback also highlights opportunities for continuous product improvement.

Student responses in the large-group trial yielded a feasibility score of 91%, indicating strong acceptance and engagement (Barker & Gribble, 2024). This finding suggests that game-based learning elements, such as quizzes and score histories, successfully increased student interest and participation. Prior research has shown that educational games can enhance motivation and engagement, particularly in history learning, by transforming abstract content into interactive experiences (Li, Chen, & Deng, 2024).

In terms of cognitive learning outcomes, the substantial increase in mean scores from pretest (67.5) to posttest (85) demonstrates that Historia Trivia effectively enhanced students' historical understanding. This improvement supports constructivist learning theory, which posits that learners build knowledge more effectively through active engagement and meaningful interaction with learning content (Jumaah, 2024). The integration of quizzes encouraged students to actively recall and apply historical concepts.

The findings also reveal a significant improvement in students' digital literacy skills, as evidenced by the large gain in digital literacy assignment scores (37.5 points). This result indicates that Historia Trivia not only functioned as a content-delivery tool but also fostered students' abilities to access, process, and present digital information. This aligns with contemporary educational goals emphasizing the integration of digital literacy within subject-based learning (UNESCO, 2018).

The use of mind-mapping tasks within the learning process appears to have played a key role in improving digital literacy. Mind mapping supports critical thinking, information organization, and digital creativity, which are core components of digital literacy frameworks (Belshaw, 2014). The integration of such tasks demonstrates that digital learning media can simultaneously support cognitive and skill-based learning outcomes.

Furthermore, the combination of learning materials, quizzes, and automated scoring systems reflects effective game-based learning principles (Tinterri et al., 2024). Immediate feedback, as provided by automated scoring, has been shown to enhance learning by helping students identify errors and reinforce correct understanding in real time (Hattie & Timperley, 2007). This feature likely contributed to the observed learning gains.

Overall, the discussion of findings suggests that Historia Trivia represents an effective digital learning innovation for history education. By combining sound instructional design, engaging game mechanics, and digital literacy integration, the application addresses both academic achievement and 21st-century skill development. These results support the continued use and further refinement of game-based digital media in history learning, particularly in secondary education contexts.

## CONCLUSION

Based on the development process and trial results, several conclusions can be drawn. First, the Historia Trivia learning media is feasible for use in history instruction, as evidenced by expert validation and teacher and student responses that fall within the very feasible category, with average scores of 90% or higher. Second, the use of this learning media effectively improved students' cognitive learning outcomes, as indicated by an average gain of 17.5 points in pretest–posttest scores. Third, the learning media was also effective in enhancing students' digital literacy skills, demonstrated by an average increase of 37.5 points in digital literacy assignment scores.

Based on these findings, several recommendations are proposed. Teachers are encouraged to provide initial guidance and facilitate the optimal integration of Historia Trivia into history learning activities. Schools are expected to offer technical support, including adequate devices and internet connectivity, as well as professional development opportunities to help teachers become more familiar with the use of digital learning media.

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