

Development of Media Story Mapping "Jejak Cahaya di Nusantara" Based on Game-Based Learning and MUSIC Model for Grade X Students

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Abstract

History learning in Indonesian senior high schools continues to rely on lecture-based instruction and static textbooks, resulting in low student motivation particularly among Generation Z learners who are accustomed to visual and interactive content. This development research aimed to produce an interactive story mapping learning medium titled "Jejak Cahaya di Nusantara" for Grade X students on the topic of the entry of Islam into the Nusantara. The medium was developed using the ADDIE model, limited to formative evaluation, with the theoretical framework of Game-Based Learning (GBL) and the MUSIC Model of Motivation. Needs analysis was conducted through a literature-based desk study due to field access limitations. The final product is a web-based application consisting of four explorable routes (Gujarat, Persia, Makkah, and China), four playable characters, a badge system, and twelve quizzes aligned with MUSIC principles. Media expert validation yielded an average score of 4.58 out of 5 (89%), categorised as "Very Feasible." Feasibility testing produced an average score of 4.76 out of 5 (95%), also categorised as "Very Feasible." Qualitative feedback indicated that the gamification system effectively increased learning engagement, though item discrimination in quiz questions requires improvement. This study recommends full-scale implementation in classroom settings and further experimental research to measure the medium's effect on learning outcomes.

Keywords: Story mapping; game-based learning; MUSIC model; history of Islam in Nusantara; Educational Media Development



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INTRODUCTION

History learning in high school faces unresolved structural problems: lecture methods are still the main choice, and package books are the only learning resources available. This condition results in a passive and monotonous learning environment, where students are only asked to memorize dates, character names, and sequence of events without understanding their relevance. Aini et al. (2024) found that before the Problem-Based Learning intervention, the completeness of history learning in class X only reached 69.4%, with the motivation categorized as not optimal. Sari et al. (2019) confirmed that external factors such as unvaried teacher methods and less interesting media contribute significantly to the low interest and learning attitude of students in history subjects in high school.

This problem becomes even more acute when faced with the characteristics of today's learners. Class X students born around 2008–2010 are classified as the late Generation Z, who grew up with short and visual digital content. Urba et al. (2024) describe this generation as a group that tends to ignore monotonous stimuli and needs media that stimulates active engagement. Tafonao et al. (2020) further emphasized that media and technology are no longer just complementary tools, but basic learning needs for this generation. Chen et al. (2022) added that heavy consumption of short-form videos—which has become a daily occurrence of this generation—correlates with decreased sustained attention and increased off-task behavior in the classroom. In other words, the gap between the digital stimulus patterns students receives outside the classroom and the learning experiences offered in the classroom continues to widen.

Game-Based Learning (GBL) has emerged as one of the approaches that has consistently been proven to bridge this gap. Yu et al. (2020) through meta-analysis found that educational games have a positive impact on student motivation, engagement, and learning satisfaction. Li et al. (2024) show that an immersive digital environment reinforces the effect of GBL on motivation, with learning engagement as a key mediator. However, GBL without a structured motivational framework risk producing products that are superficially appealing but pedagogically superficial. This is where the MUSIC (eMpowerment, Usefulness, Success, Interest, Caring) Model developed by Jones (2019) becomes relevant: it provides a design framework that ensures each element of media is not merely entertaining, but systematically stimulates students' intrinsic motivation. For historical and cultural contexts, Rizvić et al. (2019) and Petousi et al. (2022) show that digital interactive storytelling with narrative branches and decision points is able to encourage historical empathy and critical reflection—two skills that cannot be achieved through memorization alone.

Based on the above argument, this study developed a web-based story mapping media entitled "Footprints of Light in the Archipelago" for the material on the Entry of Islam into the Archipelago in high school students in grade X. The product is designed using the GBL approach integrated with the principles of the MUSIC Model, with the aim of producing a media that is not only technically feasible, but also motivationally able to transform the experience of learning history from an obligation to a narrative exploration that is meaning.

RESEARCH METHODS

This research is a research and development research that refers to the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. The application of the model is limited to the formative evaluation stage, considering that the scope of the research does not include effectiveness tests in regular learning.

Analysis Stage

Needs analysis is carried out through literature review and conceptual analysis (desk study), not through observation or field interviews. This approach was chosen due to the limited access to partner schools in the study period. Needs data were obtained from relevant previous

studies, including: (1) factors causing low motivation to learn history in high school (Aini et al., 2024; Sari et al., 2019), (2) characteristics of Generation Z learning styles (Urba et al., 2024; Tafonao et al., 2020), and (3) the effectiveness of GBL and the MUSIC model in the context of learning (Yu et al., 2020; Li et al., 2024). Although the analysis was not empirically conducted in the field, the literature findings used were sourced from research with subjects that were demographically and contextually relevant to the target of this media.

Design Stage

The design stage produces a media blueprint consisting of: (1) user persona analysis—the fictional character of Aditya Pratama, a 16-year-old student of class X with a visual-kinesthetic learning style; (2) a narrative storyline that contains four paths of historical exploration (Gujarat, Persia, Makkah, China); (3) storyboards detailing visuals, narratives, user interactions, and technical notes; (4) gamification system—four characters with different ability bonuses, seven types of badges, a point system, and three Final Quests; and (5) mapping of MUSIC components to each design element.

Development Stage

Product development is carried out using the Lovable platform, resulting in a web-app story mapping that can be accessed through a browser. The final product contains an interactive map of the archipelago, four narrative paths containing five stories and three quests each, a badge system with unlock logic, and a score panel and player ID cards. All elements are developed based on a storyboard that has been compiled at the Design stage.

Implementation and Evaluation Stage

The implementation was carried out on a limited trial considering the limited access to regular classes. The scope of implementation includes: (1) product validation by one media expert, and (2) feasibility test by the teacher as a user. The media expert validation instrument consists of 26 indicators covering six aspects: Visual Design & Display, Navigation & Interactivity, Interactive Maps, Quiz & Feedback System, Badge & Reward System, and Technical & Accessibility. The student eligibility instrument contains 18 statements on five aspects: Ease of Use, Content & Materials, Visual & Interactive Maps, Gamification, and Motivation & Benefits. Both use a Likert scale of 1–5.

The data were analyzed using the feasibility percentage formula $P = (\Sigma \text{score} / \Sigma \text{score maximum}) \times 100\%$, with interpretation criteria as shown in Table 1.

Table 1. Media Eligibility Percentage Criteria

Percentage (%)	Categories	Actions
81% – 100%	Highly Worth It	No revision required
61% – 80%	Worthy	Minor revisions
41% – 60%	Quite Decent	Significant revisions
<40%	Not Eligible	Unusable

RESULT AND DISCUSSION

Findings of the Analysis Stage

The literature review identifies two mutually reinforcing root problems. First, in terms of pedagogy: history learning in high school is still teacher-centered, with the dominance of lecture methods and the lack of media variety. Aini et al. (2024) noted that before the intervention, the average historical score of class X Phase E was only 80 with a completeness of 69.4%—a figure that increased sharply to 85 and 97.2% after the implementation of PBL. This indicates that the problem is not in the cognitive capacity of students, but in learning designs that do not facilitate active engagement. Second, in terms of learner characteristics:

Generation Z who dominate class X today needs a stimulus that is qualitatively different from that provided by the package book. The findings of Chen et al. (2022) that short-form video consumption is negatively correlated with sustained attention clarify why the text-static format loses its appeal. These two root causes together support the argument that the development of interactive media based on digital narratives is a targeted response.

Design Stage Results: MUSIC-Based Media Design

The design of "Footprints of Light in the Archipelago" is built on two premises: (1) the material of the entry of Islam into the archipelago has a multi-perspective structure that is naturally suitable for the format of a branched narrative map; and (2) each gamification element must be able to be traced back to one of the components of MUSIC. Table 2 shows the mapping explicitly.

Table 2. Mapping MUSIC Components on Media Design Elements

MUSIC Components	Design Elements	Implementation in Media
eMpowerment	Character selection & path	4 characters with different bonuses; The order of the free lanes is determined by the students
Usefulness	Contextual narrative & virtual museum	The story connects the events of the 13th century with the reality of Indonesia today
Success	Graded points & feedback system	Three trials per quest; automatic hint; The score does not drop below zero
Interest	Cinematic opening & interactive NPCs	Narrative scenes with dialogue; Visual atmosphere per lane
Caring	Motivational messages & empathic feedback	The system's response is not over-punitive; Encouragement Messages on Incorrect Answers

The character designs—Raka (merchant), Fatima (scholar), Bagas (sailor), Arya (noble)—are not merely aesthetic, but each represent a different perspective on the entry of Islam into the archipelago. It implements a multi-perspective principle that Rizvić et al. (2019) emphasized as key in digital cultural heritage education: good history learning does not offer a single truth, but rather encourages students to negotiate multiple points of view.

Development Stage Results: Final Product Description

The final product of "Jejak Cahaya di Nusantara" is a web-application that can be accessed through the following link <https://jejakcahayadinusantara.lovable.app> without any installation. The navigation structure follows a non-linear flow: after selecting a character, students are directed to an interactive archipelago map in the style of an antique illustration, where four paths can be chosen in free order. Each path contains five narrative scenes with interactive NPCs and three multiple-choice quests. The three Final Quests come after all the paths are completed, demanding synthesis and cross-track analysis (Higher Order Thinking Skills). Successfully completing all paths and answering Final Quest 3 unlocks the "Great Nusantara Explorer" Master Badge and the "Expert of the Islamic Historian of the Archipelago" Identity Card—elements designed to provide a sense of accomplishment, according to the Success component in MUSIC.



Figure 1. Home Page



Figure 2. Character Selection Page



Figure 3. Path Selection Page

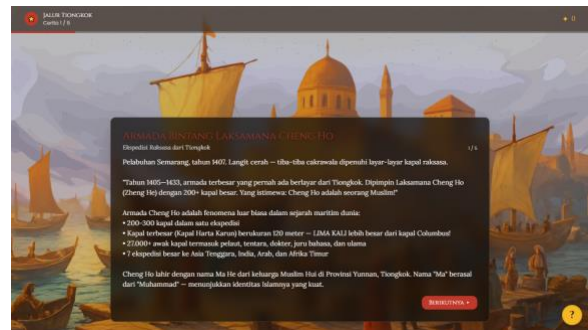


Figure 4. Path Page



Figure 5. Path Quiz Page



Figure 6. Museum Pages



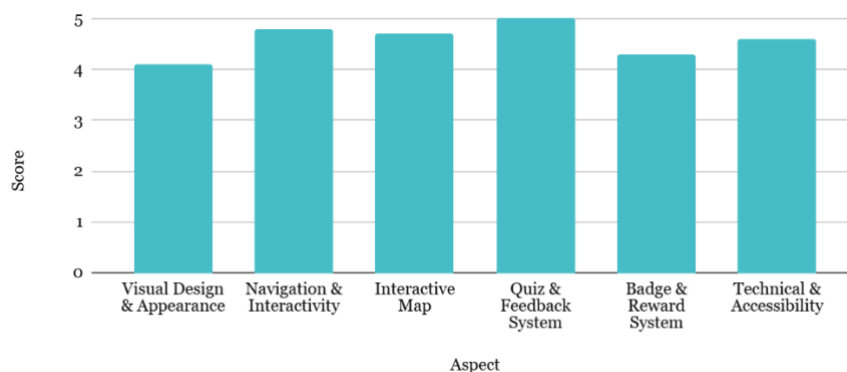
Figure 7. Badge Display



Figure 8. Final Quiz Page

Media Expert Validation Results

Validation is carried out by one media expert with experience in the field of technology-based learning media development. The results of the assessment per aspect are presented in Graph 1.

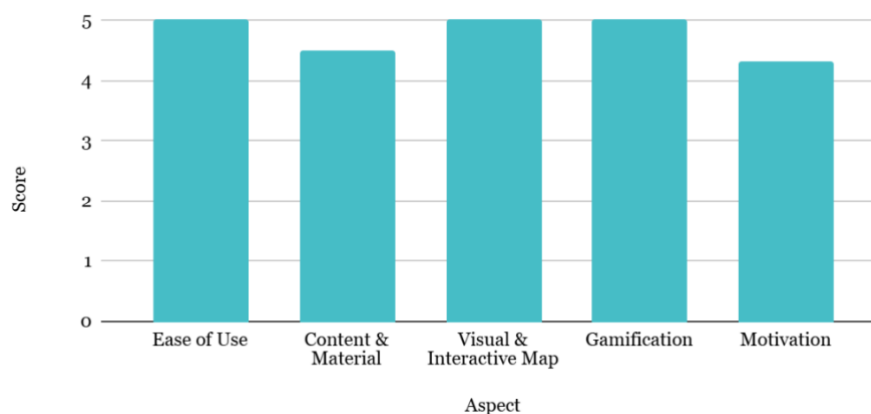


Graph 1. Media Expert Validation Results per Aspect

The Quiz & Feedback System aspect obtained a perfect score (5; 100.00%), confirming that the designed feedback mechanism has fully met the eligibility standards. This score is consistent with the argument that structured feedback directly reinforces the Caring and Success components in the MUSIC model—the media provides a measurable motivational boost to the user through an empathetic, rather than punishing, system response. The Navigation & Interactivity aspect obtained the second highest score (4.8; 96.00%), indicating that the flow between pages and user interaction mechanisms was designed intuitively so that high school students could operate without significant technical barriers. The Interactive Maps (4.7; 94.00%) and Technical & Accessibility (4.6; 92.00%) aspects also support these findings—both of which show that web-based products developed through the Lovable platform are capable of providing a stable, cross-device user experience. In contrast, the Visual Design & Display aspect scored the lowest (4.1; 82.00%)—although it is still in the Very Decent category, the difference with other aspects indicates that the consistency of visual elements such as typography, color palette, and layout can still be improved in the next iteration. The Badge & Reward System aspect obtained a score of 4.3 (86.00%), confirming that the reward mechanism designed is quite effective in giving users a sense of accomplishment. Overall, validators suggest the addition of usage documentation videos and developer profiles as elements that can increase the product's credibility for new users.

Feasibility Test Results

The feasibility test involves Class X high school teachers in History Subjects as initial user respondents. The results of the assessment per aspect are presented in Graph 2.



Graph 2. Feasibility Test Results per Aspect

The results of the student feasibility test showed three aspects of obtaining perfect scores: Ease of Use (5; 100.00%), Visual & Interactive Maps (5; 100.00%), and Gamification (5; 100.00%). A perfect score on the Gamification aspect confirmed that the badge, points, and quest system was responded to very positively by young users—in line with the findings of Lampropoulos et al. (2023) that gamification in the context of education effectively increases students' cognitive and emotional engagement. A perfect score on the Ease-of-Use aspect indicates that the navigation and media interface do not pose any technical barriers for high school students, while a perfect score on the Visual & Interactive Map aspect confirms that the antique illustration design on the archipelago map and the visual consistency between the paths successfully meet the user's aesthetic expectations. The Content & Material aspect received a score of 4.5 (90.00%), indicating that the historical content presented was clear and easy to understand, although there is still room for improvement—especially regarding the difficulty of the questions that will be discussed in the next section. The Motivation aspect scored the lowest in this feasibility test (4.3; 86.00%), but remained in the Very Feasible category. The difference between the Motivation score and other aspects that are perfect suggests that although the media manages to capture students' attention technically and visually, its long-term motivational impact requires further verification through experimental studies.

The most substantive qualitative input is related to the difficulty level of the question. One respondent noted: "without even reading the material I can guess which answer is correct... There is no trickster option to trap." These findings identify a gap between the already robust narrative design and the assessment design. Technically, this is a problem with item discrimination—the designed answer options are less able to distinguish students who understand the material from those who simply guess logically. This weakness does not delegitimize the media, but it does affirm the need for revision at the cognitive level of the question—from mere recall to application or analysis in Bloom's taxonomy.

Discussion

Overall, the validation results (89%) and feasibility test (95%) both placed "Footprints of Light in the Archipelago" in the Very Feasible category. More than just numbers, inter-aspect scoring patterns provide richer information. The consistency of high scores on the gamification aspect of two independent data sources (validators and students) confirmed that the implemented GBL mechanism was successful. This supports Li et al.'s (2024) argument that learning engagement is a key mediator between game design and motivation—when students are engaged, they are motivated; When motivated, the learning process takes place more effectively.

The mapping of MUSIC into design elements proved to be not just a theoretical justification, but an operational design guide. The eMpowerment component is embodied in the freedom to choose characters and path sequences—choices that substantially change the gaming experience. The Usefulness component is realized through narratives that explicitly connect 13th-century events with the reality of Indonesia today, such as the roots of Arabic-Persian absorption words in Indonesian or the existence of the Holy Tower Mosque that is still standing. The Interest component is realized through scenes with a different atmosphere—the bustling port of Gujarat is visually different from the atmosphere of the Persian Line. Such a design is consistent with the multimodal principle emphasized by Urba et al. (2024) as the main pedagogical needs of Generation Z.

The gap that needs to be addressed the most is the quality of the quiz items. If the quiz is designed only at the recall level (C1), then the use of this medium will not produce significantly different learning outcomes from reading a regular textbook. Follow-up research should revise the item to a minimum level of understanding (C2) and apply item analysis before

full implementation. This is in line with the suggestion of Petousi et al. (2022) that effective digital storytelling needs to be accompanied by a critical reflection mechanism, not just fact verification.

CONCLUSIONS

This research succeeded in developing the media story mapping "Footprints of Light in the Archipelago" that met the feasibility criteria from two sources of assessment: validation of media experts and teacher feasibility tests. This media answers concrete problems in high school history learning—low motivation due to conventional approaches—with solutions that can theoretically be accounted for through the integration of GBL and the MUSIC Model.

There are two limitations to note: first, desk study-based needs analysis cannot completely replace field observation; Second, limited implementation does not allow for the measurement of impact on actual learning outcomes. These second limitations also open up the agenda of the next research—quasi-experimental studies to measure the effectiveness of media on students' motivation and learning achievement, accompanied by the revision of quiz items to a higher cognitive level.

From a development perspective, "Footprint of Light in the Archipelago" proves that the integration of GBL and the MUSIC model can produce historical media that simultaneously meets technical and motivational standards. The MUSIC-to-element mapping approach used in this study can be adopted as a design framework in the development of other social studies media, especially for rich multi-perspective topics such as the history of civilization and culture.

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