

The Use of Terra Incognita AI Chatbot in History Learning

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ABSTRACT

The rapid development of artificial intelligence has created new opportunities for developing digital learning media, particularly in history education. This study aimed to develop and evaluate an artificial intelligence-based chatbot, Terra Incognita, as a history learning medium for university students. The study employed a Research and Development (R&D) approach consisting of the stages of design, prototype development, expert validation, user testing, and product evaluation and revision. The expert validation results indicated that Terra Incognita was highly feasible as an AI-powered history chatbot. The participants involved in this study consisted of one technology expert for expert validation and 37 user participants, including undergraduate students from several universities in Indonesia and members of the general public, for implementation and user testing. Furthermore, user testing demonstrated that the chatbot effectively enhanced students' understanding of historical content, was practical to use without requiring prior training, improved learning experiences, and encouraged independent knowledge exploration. These findings suggest that Terra Incognita is a feasible and effective artificial intelligence-based chatbot for history learning. Nevertheless, further development is recommended to improve data storage capabilities and provide more personalized learning experiences for users.

Keywords: Chatbot, Artificial Intelligence, History Learning, Research and Development (R&D), Terra Incognita

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INTRODUCTION

History is one of the fundamental fields of study in higher education, particularly in programs related to the social sciences, humanities, and education. Through history learning, university students are not only expected to understand past events but also to examine the dynamics of social, cultural, economic, and political change from a comprehensive historical perspective. Beyond reconstructing historical events, history serves as a means of developing critical awareness, collective identity, and reflective thinking toward contemporary issues.

Despite its importance, history education in higher education continues to face numerous challenges. History courses are frequently perceived as less engaging and more monotonous than other subjects that emphasize practical skills and direct applications. This perception is closely associated with conventional teaching approaches that remain predominantly instructor centered and focus heavily on memorization of historical facts rather than analytical understanding.

According to Soininen (2022), many students regard history as merely a collection of facts, dates, and events to be memorized rather than a discipline that helps them critically understand the world. Such perceptions reduce students' engagement in the learning process, resulting in passive and less meaningful classroom experiences. Similarly, Ofianto & Aman et al (2021) argues that historical thinking including analysing historical sources, understanding context, and constructing interpretations is a complex cognitive skill that cannot be developed through rote memorization alone. Instead, it requires innovative and reflective pedagogical approaches that encourage students to actively engage with historical evidence.

These challenges have become increasingly significant in the context of twenty-first-century education, which emphasizes the development of critical thinking, creativity,

collaboration, and communication skills. The [UNESCO \(2021\)](#) Futures of Education report highlights that education can no longer rely solely on one-way knowledge transmission but must evolve toward participatory, contextualized, and learner centered learning. Consequently, history education should be reoriented from simply delivering historical information to facilitating active and meaningful knowledge construction. At the same time, rapid advances in digital technology, particularly artificial intelligence (AI), have created new opportunities to design more adaptive and interactive learning environments.

One of the rapidly emerging AI technologies is the chatbot, which is capable of simulating human conversation and providing real-time responses. Recent studies have demonstrated the considerable potential of chatbots to enhance learning quality. For example, [Najib \(2024\)](#) found that the use of chatbots in history education significantly increased students' engagement and enriched their exploratory learning experiences. However, their study was limited to primary and secondary education and did not comprehensively incorporate historical pedagogy into the chatbot design.

Recent studies have shown that AI-powered chatbots are increasingly being integrated into higher education to support personalized, interactive, and self-directed learning. Rather than serving merely as question-answering tools, modern educational chatbots provide adaptive feedback, scaffold students learning processes, and encourage critical thinking through continuous dialogue. Recent evidence indicates that these technologies positively influence students' engagement, motivation, learning satisfaction, and academic performance when effectively integrated into instructional activities ([Kasneci et al., 2023](#); [Tlili et al., 2025](#)). These findings suggest that AI chatbots have evolved into valuable learning companions capable of supporting student-centered learning environments.

Similarly, [Lee \(2024\)](#) reported that AI-powered chatbots have considerable potential to promote deep and interactive history learning by enabling students to develop richer understandings of historical events. Chatbots also provide immediate access to historical information, supporting both instructors and students during classroom learning. Likewise, [Deng & Yu \(2023\)](#) concluded that AI chatbots positively influence learner engagement, motivation, and academic performance across various educational contexts.

Furthermore, [Labadze et al. \(2023\)](#), in their systematic review, emphasized the importance of designing adaptive and context-aware chatbots to facilitate personalized learning experiences. Nevertheless, they also highlighted the challenges of ensuring the accuracy and relevance of AI-generated information. This concern is reinforced by Stiles, Crawford, and Yang, who identified the phenomenon of AI hallucination in generative chatbots, referring to the tendency of these systems to generate information that appears credible but is factually inaccurate. These findings indicate that the development of educational chatbots requires not only advanced artificial intelligence technologies but also a strong pedagogical foundation to ensure the reliability and educational value of the generated content.

Despite these promising developments, the application of AI chatbots in history education remains relatively underexplored, particularly in higher education. History learning requires students not only to memorize historical facts but also to analyse evidence, compare multiple perspectives, and construct historical interpretations. Therefore, AI chatbots should be designed not merely to deliver information but also to facilitate historical inquiry, contextual understanding, and critical reflection. However, most previous studies have focused on chatbot implementation rather than the systematic development and evaluation of AI-powered history learning platforms specifically designed for higher education.

In addition, [Wong et al. \(2024\)](#), in a study involving university students at the National University of Singapore, demonstrated that chatbots designed according to learners' contexts significantly improved students' motivation and learning experiences. These findings further support the potential of AI technologies in higher education when technological innovations are aligned with learners' characteristics and instructional objectives. Nevertheless, several research gaps remain. Recent reviews indicate that research on generative AI chatbots in higher education has largely focused on students' perceptions, learning experiences, personalization, and general educational applications, while the pedagogical foundations and

discipline-specific applications of these technologies remain insufficiently developed (Badger et al., 2026; McGrath et al., 2025).

Moreover, relatively few studies have examined the use of AI chatbots specifically for history learning. Mierwald (2024), for example, investigated students' interactions with ChatGPT while completing a history-learning task involving an interview with a historical figure. The study demonstrates the potential of conversational AI to create interactive learning opportunities in history education, while also highlighting the need to examine how students interact with and critically engage with AI-generated historical information. This issue is particularly important because students using AI chatbots may encounter limitations concerning the accuracy and credibility of generated information, requiring users to critically evaluate AI outputs rather than accept them uncritically (Phan & Teng, 2024).

Addressing these gaps is important because history learning requires instructional media that not only provide access to historical information but also encourage students to critically interpret historical events, examine perspectives, and engage in historical inquiry through interactive dialogue. The emerging literature suggests that AI chatbots can provide personalized support, immediate responses, and opportunities for self-directed learning in higher education; however, their pedagogical value depends on how they are designed and integrated into specific learning contexts (Badger et al., 2026). Existing research has generally examined AI chatbots as broad educational or learning-support tools rather than as systematically designed tools that incorporate the specific pedagogical characteristics of history education. Therefore, there remains a need to develop and systematically evaluate an AI-powered chatbot that integrates conversational artificial intelligence with history-specific instructional principles. This study addresses this gap by developing and evaluating Terra Incognita, an AI-based chatbot designed to support independent, interactive, and meaningful history learning in higher education.

The increasing demand for self-directed learning models has become particularly important in the digital era, where flexibility and adaptability are essential competencies for university students (Younas et al., 2025). In response to this need, the present study developed an artificial intelligence-based history learning platform named Terra Incognita. Rather than functioning solely as an information provider, Terra Incognita was designed as an interactive learning environment that encourages students to actively explore, analyse, and interpret historical knowledge through meaningful dialogue.

Powered by a Large Language Model (LLM) based on Llama, Terra Incognita enables dynamic interactions in which students can ask questions, test historical hypotheses, and construct their own understanding through structured critical conversations. Accordingly, this study addresses the identified research gap by developing and evaluating Terra Incognita, an AI-powered chatbot specifically designed for history learning in higher education. The study aims to examine its feasibility, practicality, and effectiveness in supporting independent, interactive, and meaningful learning experiences among university students.

METHOD

This study employed a Research and Development (R&D) approach using the ADDIE instructional design model developed by Branch (2009). The ADDIE model consists of five sequential phases: Analysis, Design, Development, Implementation, and Evaluation. This model was selected because it provides a systematic framework for designing, developing, implementing, and evaluating educational products. In this study, the ADDIE model guided the development and evaluation of Terra Incognita, an artificial intelligence-based chatbot for history learning.

The research consisted of five stages. The analysis stage involved identifying students' learning needs and technological requirements through a literature review, observations, and interviews. During the design stage, the chatbot architecture, conversational flow, and integration of the Llama Large Language Model (LLM) were developed. The development stage included system implementation using JavaScript (Next.js), Tailwind CSS, and the Groq

API, followed by preliminary validation conducted by a technology expert. A total of 37 respondents participated in the implementation and user testing phases of this study. The participants consisted of students from various universities across Indonesia, as well as general students, who voluntarily evaluated the Terra Incognita chatbot as a tool for history learning. Most participants were accustomed to digital technology and had prior experience accessing online learning resources, making them suitable users to evaluate an AI based educational chatbot. Respondents were selected using purposive sampling because they met the inclusion criteria is possessing basic digital literacy and an interest in history learning.

Observation

Observations were conducted during the introduction and implementation of the Terra Incognita chatbot in three locations: the History Laboratory, Faculty of Social and Political Sciences, Universitas Negeri Surabaya, the Bank Indonesia Library in Surabaya, and Apsari Park, Surabaya. These observations were intended to examine user interactions and identify the chatbot's performance in different learning environments.

Questionnaire

Questionnaires were administered to evaluate users' responses to the use of Terra Incognita as a history learning medium and to assess its feasibility, practicality, and effectiveness. This instrument enabled the researchers to collect data on students' and community members' perceptions regarding the chatbot's response quality, ease of use, and contribution to improving their understanding of historical concepts.

Interview

Semi-structured interviews were conducted to obtain a deeper understanding of the effectiveness of Terra Incognita in supporting history learning. The interviews also served as complementary data by exploring users' experiences, challenges encountered during chatbot interaction, and their evaluations of the chatbot's interaction quality and the accuracy of the historical information it provided.

Documentation

Documentation was used to record the entire development and implementation process of Terra Incognita, from the initial design stage to user testing. The documentation included screenshots of the user interface, validation reports and revision notes from technology experts, and records of technical modifications made throughout the development process. These documents served as empirical evidence of the research implementation and supported the interpretation and analysis of the collected data.

Respondents

A total of 37 respondents participated in the implementation and user testing phase of this study. The participants consisted of undergraduate students from several universities in Indonesia and members of the general public who voluntarily evaluated the Terra Incognita chatbot as a history learning medium. The respondents were selected using purposive sampling, as they met the inclusion criteria of having basic digital literacy and an interest in history learning. They were asked to interact with the chatbot by exploring historical topics, asking questions, and evaluating the system based on its feasibility, practicality, and effectiveness. Their feedback was collected through a structured questionnaire using a four-point Likert scale, complemented by interviews to obtain more comprehensive qualitative insights into their learning experiences and perceptions of the chatbot's performance.

Instruments

The study employed four instruments to collect research data: observation, questionnaires, interviews, and documentation. Observation was conducted to examine users' interactions with the Terra Incognita chatbot during the implementation phase in different learning environments. A structured questionnaire based on a four-point Likert scale (1 =

strongly disagree to 4 = strongly agree) was used to evaluate users' perceptions of the chatbot in terms of system feasibility, usability (practicality), and learning effectiveness.

Semi-structured interviews were conducted to obtain more in-depth information regarding participants' learning experiences, the challenges they encountered while using the chatbot, and their perceptions of the quality and accuracy of the historical information provided. In addition, documentation was used to record the entire development process, including interface design, system revisions, expert validation reports, implementation activities, and technical improvements made throughout the research. These documents served as supporting evidence for the data analysis and interpretation.

Procedures

The research procedures followed the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model to develop and evaluate the Terra Incognita chatbot as an artificial intelligence-based history learning medium. During the Analysis phase, the researchers identified students' learning needs and challenges in history education through a literature review, observations, and interviews. This stage also involved analysing the technological requirements necessary for developing an AI-powered chatbot capable of supporting independent and interactive learning.

In the Design phase, the chatbot architecture, user interface, conversation flow, and instructional framework were designed. The system was planned to integrate the Llama Large Language Model (LLM) to provide contextual and adaptive responses to users' historical inquiries. The interface design emphasized usability and intuitive interaction to facilitate students' learning experiences.

The Development phase involved implementing the chatbot using JavaScript (Next.js) as the primary development framework, Tailwind CSS for the user interface, and the Groq API for integrating the Llama model. After the prototype was completed, the system underwent expert validation to assess its technical quality, interface design, and overall functionality. Feedback from the technology expert was incorporated into the first revision of the chatbot before user testing.

During the Implementation phase, the revised chatbot was tested with 37 respondents, consisting of university students and members of the general public. Participants interacted with Terra Incognita by exploring history-related topics, asking questions, and completing learning activities. After using the chatbot, they completed questionnaires and participated in interviews to evaluate the system's feasibility, usability, and learning effectiveness.

Finally, the Evaluation phase consisted of analyzing quantitative and qualitative data obtained from questionnaires, interviews, observations, and documentation. The findings were used to identify the chatbot's strengths and limitations and to formulate recommendations for further improvements, particularly regarding user personalization, chat history functionality, and system performance.

Data Analysis

The data collected from the questionnaires were analysed using descriptive statistics to determine the feasibility, usability, and effectiveness of the Terra Incognita chatbot. Responses were measured using a four point Likert scale, and the mean scores were converted into percentages to classify the chatbot's quality into predefined feasibility categories (Sugiyono, 2019). The descriptive analysis provided an overview of participants' perceptions regarding the chatbot's technical performance, ease of use, and contribution to history learning.

Qualitative data obtained from interviews, observations, and documentation were analysed using thematic analysis. The researchers first organized and coded the collected data, identified recurring themes, and interpreted the findings according to the research objectives. The qualitative results were used to complement the quantitative findings by providing a deeper understanding of users' learning experiences, perceived benefits, challenges encountered, and recommendations for improving the chatbot.

To enhance the credibility of the findings, data triangulation was employed by comparing information obtained from questionnaires, interviews, observations, and documentation (Nowell et al., 2017). This approach enabled the researchers to verify the consistency of the results and provide a more comprehensive evaluation of the Terra Incognita chatbot as an artificial intelligence-based history learning medium.

FINDINGS AND DISCUSSION

Product Development Results

The development of Terra Incognita was motivated by the growing need for more interactive and technology enhanced approaches to history learning. Based on the needs analysis and field observations, history instruction remains largely dependent on conventional teaching methods, providing limited opportunities for students to actively engage in exploring historical content. Consequently, students often demonstrate low levels of interest and participation in developing a deeper understanding of historical concepts.

Another challenge identified during the preliminary analysis was the limited availability of learning media that support direct interaction between learners and educational resources. Students generally rely on static learning materials, such as textbooks and lecturers' explanations, resulting in predominantly one-way learning experiences. However, effective history education requires learning media that not only deliver information but also facilitate dialogue, exploration, and contextual understanding of historical events.

Recent advances in artificial intelligence, particularly the emergence of AI-powered chatbots, have created new opportunities for developing more adaptive and interactive learning media. Chatbots enable real-time interaction between users and the system, allowing students to learn more flexibly and independently. In this context, chatbot-based learning media represent a promising alternative for enhancing the quality of history education by providing a more dialogic, student-centered, and exploratory learning experience.

The development of Terra Incognita followed several systematic stages. The design phase consisted of two major components: (1) designing the system architecture and selecting the appropriate technological resources to support both instructional content and system requirements, and (2) designing the user interface and interaction workflow. Each component was systematically developed to ensure the integration of pedagogical, technological, and functional aspects within the Terra Incognita platform.

During the interface design process, the V0 application was utilized to create the initial visual prototype of the chatbot. This tool facilitated the development of a user-friendly interface that presents historical information in an engaging and visually appealing manner when users search for history-related topics. The resulting interface design is illustrated in Figure 1.

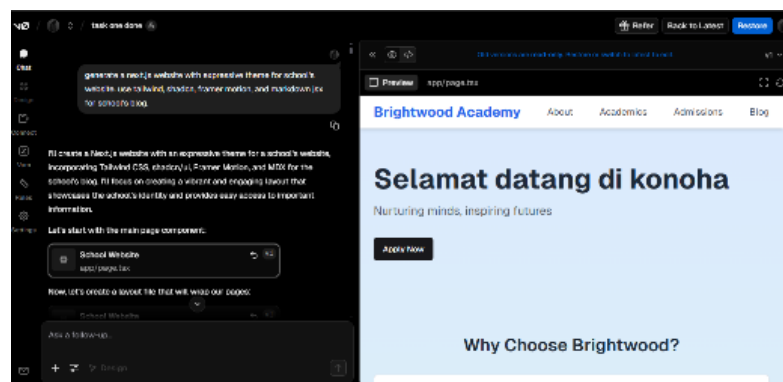


Figure 1. V0 Interface

Then, with the support of V0 software, JavaScript, and UI/UX design, the application could be developed over several months until reaching the final stage. In addition to preparing

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the necessary tools, the researcher also designed the chatbot interaction structure so that the user experience would be systematic and easy to follow. This design was important to ensure that the chatbot could provide a logical and engaging communication flow as a virtual assistant. In general, the conversation flow of Terra Incognita was designed through the following stages:

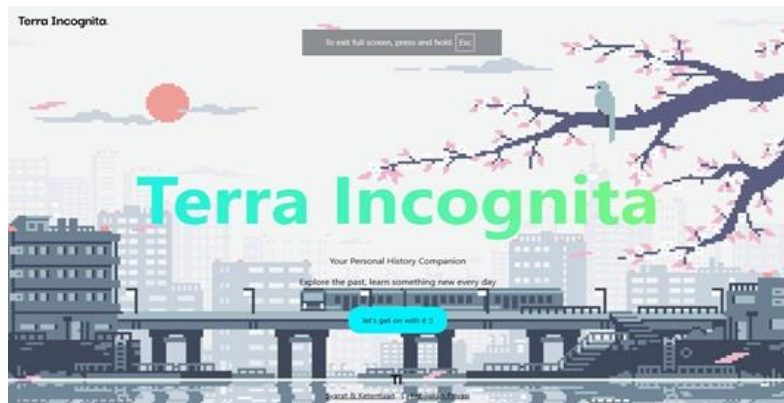


Figure 2. Landing Page

The landing page displays the identity of the Terra Incognita (Ti.) chatbot, featuring pixel-art illustrations of a city and cherry blossom trees. It includes a "Let's get on with it :)" button that directs users to the sign-up/login page, where they can either create a new account or sign in to an existing one. After successfully registering and logging in, users are presented with the main introduction interface of Terra Incognita, as shown below.



Figure 3. Conversation Page

The Terra Incognita (Ti.) conversation page is used to search for information related to historical materials. On this page, users can use the application according to their historical learning needs. Furthermore, the Terra Incognita application displays historical answers, as shown in the figure below:



Figure 4. Display of Historical Material Search Results

The figure above shows that the application provides information on the history of archaeology in Indonesia. This application enables users to access historical materials and information more efficiently, allowing them to obtain relevant content anytime and anywhere. From this design process, the study produced an AI-based educational chatbot named Terra Incognita, developed as an interactive history learning medium. This web-based chatbot can be accessed via desktop and provides a main feature in the form of text-based question-and-answer interaction, enabling users to obtain historical information contextually and adaptively.

The system was built using the Next.js framework with the JavaScript programming language and utilized Tailwind CSS for the user interface. Its natural language processing capability is supported by the LLaMA 3 model, which is integrated through the Groq API. The development results indicate that the chatbot is able to understand user questions and provide relevant responses to historical topics, including local historical contexts. The interface was designed to be minimalist and interactive to support user comfort in exploring historical materials.

Expert Validation Results

The validation was conducted by a technology expert to assess the feasibility of the system in terms of its technical performance, user interface, and overall effectiveness. Based on the evaluation results, the system obtained an average score of 3.69, corresponding to a feasibility percentage of 92.2%, which falls into the "highly feasible" category. These findings indicate that: (a) The system architecture and chatbot processing function optimally. (b) The chatbot responses are considered relevant and adaptive. (c) The interface is fairly good, although it still requires visual refinement. The validator also provided several recommendations, such as improving the user interface design and adding a feature for saving conversation history (chat history).

Implementation and Testing Results

The testing was conducted with 37 users consisting of students from several universities and members of the general public. The testing results showed that: (a) The chatbot is easy to use and has fairly clear navigation. (b) The responses provided are relatively fast and relevant to users' questions. (c) Users felt assisted in understanding historical materials in a more interactive way. In addition, the chatbot was able to increase users' interest in learning history due to its dialogical and exploratory nature.

Product Revision Results

Based on the validation and testing results, several improvements were made to the system, particularly in: (a) Refinement of the user interface (UI/UX), (b) Improvement of layout and visual consistency, (c) Optimization of chatbot responses to make them more natural. However, several features, such as saving conversation history, have not yet been implemented due to technical limitations and the research focus, which remains at the prototype stage.

Discussion

In history learning, the need for a more interactive approach has become increasingly urgent. To date, the learning process is still dominated by conventional methods that position students as passive recipients of information. However, understanding history requires more than merely memorizing facts; it also involves the ability to interpret events, understand contexts, and connect various events chronologically and critically. The limited availability of learning media capable of facilitating this process makes the history learning experience less optimal and less engaging for students.

In addition, based on the users' experiences in this study, there was a tendency for history instruction to be dominated by a single, formal narrative that provided limited opportunities to explore alternative perspectives. Some of the 37 respondents reported that the historical

materials they had studied primarily reflected a particular viewpoint, offering few opportunities to examine different interpretations of historical events. This condition limited opportunities for critical discussion and reduced students' motivation to question and re-examine historical information in greater depth. These findings suggest that history education requires not only interactive learning media but also learning tools that present diverse historical perspectives in a more open and contextualized manner.

Therefore, there is a need for an innovative history learning medium that integrates artificial intelligence technology with the contextual and interactive nature of history education. AI-based chatbots offer considerable potential to address this need through their ability to generate real-time responses, adapt to users' questions, and support independent knowledge exploration. With these capabilities, chatbots function not only as information providers but also as learning facilitators that promote students' active engagement in the learning process.

The development of the Terra Incognita chatbot in this study demonstrates that the integration of artificial intelligence technology, particularly Large Language Models (LLMs), has significant potential to transform history education, which has traditionally been characterized by conventional and passive learning approaches. The findings indicate that the developed product is not only technically feasible but also exhibits a high level of practicality and effectiveness in supporting interactive learning processes. Conceptually, these findings reinforce the view that history education should extend beyond the mere transmission of knowledge by providing dialogic and contextual learning experiences.

In conventional learning environments, learners generally act as passive recipients of information, limiting both their cognitive and emotional engagement. The introduction of Terra Incognita as an interactive chatbot addresses this limitation by creating a dialogic learning environment that enables users to explore historical content independently and flexibly. From a product development perspective, the implementation of the ADDIE model proved to provide a systematic framework for designing, developing, and evaluating technology-based learning media. Each phase of the ADDIE model contributed to the overall quality of the final product.

From a constructivist perspective, these findings suggest that Terra Incognita supports knowledge construction by allowing learners to actively interact with historical content through questioning, dialogue, and reflection rather than passively receiving information. According to constructivist learning theory, meaningful learning occurs when learners actively construct their own understanding based on prior knowledge and new experiences. The conversational nature of the chatbot facilitates this process by encouraging students to explore multiple historical perspectives and develop contextual interpretations through continuous interaction.

The analysis phase ensured that the development process was grounded in the actual needs of users, while the design and development phases facilitated the integration of pedagogical and technological aspects. This was reflected in the chatbot's ability to generate relevant responses to history-related questions, demonstrating that the integration of the LLaMA model through the Groq API effectively supported the system's functionality.

The expert validation results, which classified the chatbot as "highly feasible," indicate that, from both technical and system design perspectives, the chatbot meets the fundamental standards required for a digital learning medium. The high scores obtained for system architecture and response processing suggest that the backend architecture and the integration of the large language model functioned effectively. Nevertheless, the recommendations for improving the user interface indicate that user experience (UX) remains an important aspect requiring further enhancement. This finding is consistent with the principle that the success of educational technology depends not only on the sophistication of the system but also on the ease and comfort with which users can interact with it.

These findings are consistent with previous studies reporting that educational chatbots generally receive high feasibility ratings when developed through systematic instructional design processes. Labadze et al. (2023) emphasized that the quality of educational chatbots

depends not only on advances in artificial intelligence but also on the integration of pedagogical principles into system design. Likewise, [Kasneci et al. \(2023\)](#) argued that AI based educational tools should combine technological robustness with instructional usability to maximize their educational value. The high feasibility achieved by Terra Incognita indicates that integrating the ADDIE development model with LLM-based technology can produce a technically reliable and pedagogically appropriate learning medium for history education.

The implementation results demonstrate the chatbot's practicality through its ease of use and system responsiveness. Users were able to understand how to operate the chatbot quickly without requiring prior training, indicating that the user interface was sufficiently intuitive. Furthermore, the rapid response time enabled by the integration of the Groq API provided an interaction experience that closely resembled real-time communication, thereby enhancing users' comfort during the learning process. These findings support the view that responsiveness and ease of access are key factors influencing the adoption of educational technologies among university students who are accustomed to digital learning environments.

This finding is in line with [\(Wong et al., 2024\)](#), who reported that AI chatbots designed according to learners' needs significantly improve students' learning experiences and motivation in higher education. Conversational AI supports active learning by providing immediate feedback and facilitating personalized interactions. The present study extends these findings by demonstrating that an AI-powered chatbot can also support history learning, a discipline that requires contextual understanding and critical interpretation rather than simple factual recall.

From the perspective of effectiveness, Terra Incognita demonstrated its ability to improve users' understanding of historical content. This can be attributed to the chatbot's capability to generate narrative, contextual, and adaptive responses tailored to users' questions. Unlike static learning resources, such as textbooks or journal articles, the chatbot facilitates two-way interaction that supports continuous clarification and deeper exploration of historical topics. Consequently, the learning process becomes more exploratory rather than merely consumptive. These findings are consistent with the study by [Beyer & Arndt \(2024\)](#), who reported that all respondents considered the chatbot and its features to be beneficial in supporting their understanding of the learning material, as it simplified the planning process and enabled them to carry out learning activities more effectively.

These results reinforce previous evidence that AI powered chatbots contribute positively to students' conceptual understanding through interactive dialogue and adaptive feedback ([Deng & Yu, 2023](#); [Lee, 2024](#)). However, unlike previous studies that primarily evaluated chatbot implementation, this research focused on the systematic development and validation of a history-specific AI chatbot using the ADDIE model. Consequently, the present study contributes not only empirical evidence regarding learning effectiveness but also a structured development framework that can be adopted in future educational technology research.

In addition, the use of the chatbot contributed to increasing users' interest in learning history. The system's interactive and flexible nature allows users to access historical information anytime according to their learning needs, thereby creating a more personalized learning experience. This finding is consistent with the characteristics of modern learners, who generally prefer fast, adaptive, and technology-enhanced access to information. In other words, Terra Incognita functions not only as a learning support tool but also as a learning medium that adapts to the preferences of the digital generation. This finding is supported by the study conducted by [Yetişensoy & Karaduman \(2024\)](#), entitled *The Effect of AI-Powered Chatbots in Social Studies Education*, which reported that AI-powered chatbots help improve students' readiness for learning and consequently increase their learning interest before classroom instruction begins.

Despite these promising results, the study also identified several limitations that should be considered. One of the primary limitations is the absence of a conversation history (chat history) feature, which may reduce the continuity of the learning process. In addition, the system is currently limited to a desktop-based version and has not yet been optimized for mobile devices, leaving room for further improvements in accessibility. From a technical

perspective, reliance on a large language model also introduces the possibility of biased or inaccurate information. However, in this study, mitigation efforts were implemented through response filtering and expert validation to improve the reliability of the chatbot's outputs.

Overall, the findings contribute to the growing body of literature on AI-supported learning by demonstrating that conversational AI can be effectively adapted to history education in higher education. While previous studies have largely examined the implementation or general educational benefits of AI chatbots, this study contributes by developing, validating, and evaluating a domain-specific chatbot grounded in instructional design principles. These findings provide empirical support for integrating generative AI into history education while emphasizing the importance of combining technological innovation with sound pedagogical design.

These limitations also provide opportunities for future development. Integrating a database to store conversation history, developing a responsive interface for mobile devices, and enhancing information validation mechanisms are several aspects that can be improved in subsequent studies. In addition, incorporating features such as the automatic presentation of academic reference sources could further enhance the chatbot's credibility as a learning medium.

In conclusion, Terra Incognita demonstrates that AI powered chatbots can serve not only as instructional support tools but also as interactive learning media capable of fostering more adaptive, engaging, and meaningful history learning experiences. With continued technological refinement and pedagogical improvement, AI based chatbots have the potential to become an integral component of future digital history education.

CONCLUSIONS

Based on the findings, the Terra Incognita chatbot was considered suitable as an AI-based history learning medium. Technology expert validation produced a feasibility score of 96.9%, categorizing the chatbot as “highly feasible.” The evaluation covered system architecture, user interface, and overall functionality. User testing further supported these findings, with respondents providing positive feedback on the clarity of learning materials, relevance of historical information, and quality of chatbot responses. The chatbot demonstrated potential to enhance users’ understanding of historical content through relevant, contextual, and comprehensive explanations. Its interactive features encouraged users to explore historical topics more deeply and increased their interest in history learning. Regarding practicality, Terra Incognita offered a user-friendly interface, rapid responses, and browser-based accessibility without requiring prior training. These characteristics support its use as a flexible learning medium for university students and the general public. Overall, Terra Incognita integrates feasibility, effectiveness, and practicality, making it a promising tool for interactive and accessible history education.

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