DEVELOPMENT OF THE GAJAH MADA HISTORY GAME APPLICATION USING RAPID APPLICATION DEVELOPMENT

Rysa Sahrial[1], Buhori Muslim[2], Mohamad Sidiq Permana[3], Reva Diva Dimas Julian[4]

[124]Informatics Engineering, Faculty of Engineering, Putra Indonesia University, Indonesia
[3]Informatics Management, Faculty of Engineering, Putra Indonesia University, Indonesia

Email: [1]rysasahrial@gmail.com, [2]buhoristtp@gmail.com, mohamadsidiqpermana@gmail.com

Article Info	ABSTRACT
	Recently, technological development has advanced rapidly in the gaming industry, transforming it from mere entertainment into a diverse and influential sector. The gaming industry now spans across various demographics, offering cognitive skill enhancement and educational potential. In contrast, history education often faces challenges due to its complexity, which leads to a lack of student interest. To address this, the study proposes a simple and engaging approach to history education, inspired by the Indonesian historical figure, Gajah Mada. This involves combining advanced gaming technology with historical narratives. The idea behind this research is the creation of an educational game that illustrates the significant role of Gajah Mada in the history of the Majapahit Kingdom. To expedite the game development process, the Rapid Application Development (RAD) methodology is used. This approach ensures faster and more responsive development by actively involving both developers and users. The application of RAD in the development of the historical game enhances content presentation through multimedia, visualization, and navigation, thereby increasing engagement. As a result, students become more enthusiastic about learning history, as evidenced by improved history subject scores.

Corresponding Author:
Rysa Sahrial
Informatics Engineering Study Program, Faculty of Engineering
Universitas Putra Indonesia, Indonesia
Email: rysasahrial@gmail.com

1. INTRODUCTION

The development of game technology has advanced rapidly in recent decades. Games are no longer just enjoyable entertainment but have become a massive industry that encompasses various genres, platforms, and interactive experiences [1]. Games are not only played by children and teenagers but also by adults from diverse backgrounds. Furthermore, games have shown potential to provide broader benefits to players [2].

Several studies have demonstrated that games can enhance cognitive skills, such as problem-solving, decision-making, and spatial abilities [3]. In addition, games can be used as effective learning tools by integrating educational concepts into gameplay mechanics [4]. On the other hand, history and culture are important aspects in understanding a nation's identity. Knowledge about historical figures who played significant roles in a country's development can foster a sense of pride and historical awareness among the younger generation [5]. However, field data shows that students are generally less interested in history lessons. This is due to the perception that history material is boring [6]. The overly complex nature of historical sources can be a significant barrier to people's interest and motivation to learn history [7].

When history material is presented with complex language, highly detailed content, or various technical terms that are difficult to understand, it can make the learning process feel complicated and exhausting for most people [8]. To address this issue, a simpler approach, stronger narratives, the use of visual illustrations, and more accessible language can help make historical sources more engaging and easier to understand for the general public [8]. In history education, it is important to recognize that the primary goal is to communicate the stories and experiences of the past in a way that is interesting, relevant, and easy to understand by all segments of society. One of the famous historical figures in Indonesia is Gajah Mada, who played a crucial role in the history of the Majapahit Kingdom [9].

Gajah Mada was a renowned general during the Majapahit era and is known as one of the key figures responsible

for unifying the Nusantara [10]. He led the unification of the Nusantara through the "Sumpah Palapa," a pledge between kingdoms in the Nusantara to unite and form the Majapahit Kingdom [11]. His struggle and brilliance in leading Majapahit have become a legend and an inspiration to many [12]. By combining advanced game technology with important historical values, the idea of developing a game that tells the story of Gajah Mada becomes both intriguing and beneficial. Through this game, players can learn about Indonesia's history and become familiar with important figures like Gajah Mada [13] [14].

This game can also enhance players' understanding and awareness of the culture and values embraced during that era. In this case, the development of this educational game is specifically targeted at elementary and middle school students (ages 10-14) [15]. The game aims to introduce the history of Gajah Mada and his significant role in the unification of the Nusantara through an engaging, interactive approach that aligns with the learning styles of the younger generation [16]. To expedite the development process of the game, the Rapid Application Development (RAD) method can be used. RAD is a software development approach that focuses on speed and flexibility. By using the RAD method, the team is expected to develop a high-quality, engaging game that meets the players' needs. This game can serve as an effective tool for both educating and entertaining players, while enriching their knowledge of history and culture [17] [18].

2. METHOD

In this research, the researchers used the RAD method to complete this project. Therefore, the following are the implementation steps for this research, in accordance with the sequence outlined in the RAD phases:

2.1 Data Collection Methods.

Essentially, various methods were employed during data collection in this research, but they adhered to the guidelines set by the development method used, namely RAD, which include the following [19]:

2.1.1 Document Study

The author employs the Document Study method to collect, analyze, and evaluate data from various relevant documents. This method involves searching for information from textual sources, such as journal articles, research reports, books, government documents, and other sources related to Gajah Mada.

2.1.2 Literature Review.

The author uses the Literature Review method to research and present a summary and analysis of the figure of Gajah Mada in various relevant literature. Through a comprehensive review of books, articles, journals, and other textual sources related to Gajah Mada, the author aims to understand the role, contributions, leadership, and impact of this figure in the history of Indonesia or the Nusantara region.

2.2 Design Method.

In system design, the author uses the Rapid Application Development (RAD) method. Here is an explanation of the phases of the Rapid Application Development method that the author employs:

Figure 1. Rappid Application Development

2.2.1 Requirements Planning

In this phase, the author identifies the objectives of the application or system and determines the information requirements to achieve those goals. Additionally, the author collects and analyzes user needs, while considering other factors that influence system design, such as time constraints, budget, and available resources. In the process of planning requirements, the author strives to gain a deep understanding of what is expected from the application or system to be developed.

2.2.2 Design Workshop

In the Design Workshop phase (Design Process), the author not only conducts the initial design process but also engages in iterative improvements to ensure that the system design reflects the previously identified needs and objectives. During the design process, the author employs a systematic and structured approach. Utilizing tools such as data flow diagrams, use case diagrams, or prototypes, the author designs the user interface and illustrates

the system's workflow.

2.2.3 Implementation

After the system design is deemed correct, the author proceeds to develop the design into a functioning program. In the Implementation phase, the author begins executing the previously created design and develops it into a program that operates effectively. This involves using programming languages, frameworks, or appropriate development tools to implement the design into executable code. The implementation process includes writing code, structuring it, and developing the user interface. The author ensures that the written code is of high quality, easy to read, and maintainable in the future. During this phase, the author also conducts unit testing to verify that each part of the program operates correctly.

3. RESULTS AND DISCUSSION

At this stage, it is the implementation of the research method or the planned application development, where all the steps and guidelines outlined in the RAD system development method are carried out, resulting in a quality application.

3.1 System Requirements Analysis

In the system analysis process, the researcher conducts an in-depth study of the essential requirements for the system to be developed. This phase includes the formulation of user stories that describe user interactions with the system, specifications for functional requirements that define the main features, as well as non-functional requirements that establish performance, security, and other non-functional aspects.

3.1.1 User Story

At this stage, the author analyzes the problems based on the results of observations and interviews conducted. The purpose of this analysis is to identify the issues that the system being designed will address. Based on the results of the document study and literature review, the core problems identified by the author are as follows:
a. The absence of an interactive and engaging historical game about Gajah Mada as a learning tool.
b. The lack of public knowledge regarding the figure of Gajah Mada, who played an important role in the past.

3.1.2 Functional Requirements

In the analysis of functional requirements, the author examines the functions needed by the system based on user stories. The following is a list of the main functions of the planned system:
a. The Gajah Mada game can provide historical knowledge.
b. The game serves as an interactive and engaging tool for learning history.

3.1.3 Non-Functional Requirements

In the analysis of non-functional requirements, the author examines the hardware, software, and user specifications necessary to operate the system being developed. The following is an explanation for each aspect of the non-functional requirements:
a. Visual Aesthetics: The user interface design should be visually appealing to enhance user engagement and help them connect with the historical material presented.
b. Hardware: This analysis outlines the hardware required for the developed system. A smartphone with the following specifications is needed:
    1. A quad-core or octa-core processor with a minimum speed of 1.6 GHz.
    2. A minimum of 4 GB of RAM.
    3. Software: This analysis details the software required for the developed system. An Android operating system with a minimum version of 5.0 (Lollipop) is necessary.

3.2 System Development Requirements Analysis

In the system development requirements analysis, the author identifies the hardware and software necessary for developing the system. The hardware and software requirements are outlined as follows:

3.2.1 Hardware Requirements

In developing the system, the author requires the following hardware:
a. Lenovo V330 Laptop: a. Processor: AMD Ryzen 3 2200U, b. Graphics: AMD Vega 3, c. RAM: 12 GB, d. SSD: M.2 NVMe 256 GB.
b. Android Smartphone (MI 11T): a. Chipset: Dimensity 1200 Ultra, b. RAM: 8 GB, d. Storage: 256 GB, e. Network: 4G.
c. LG Monitor

3.2.2 Software Requirements

In developing the system, the author requires the following software:1. Operating System: Windows 10 Professional, 2. Code Editor: Construct 3, 3. Framework: Construct 3, 4. Aseprite, 5. Photoshop, dan 6. Draw.io

3.3 System Design

In system design, the author uses UML modeling tools to design the system as a whole. The author also designs the interface using wireframes and plans the database requirements and system architecture necessary to build the system. The following are the aspects of the system design that are explained:

3.3.1 Unified Modelling Language

UML can be used to visualize and design the structure of the system graphically. The following is the design that will be created in this writing:
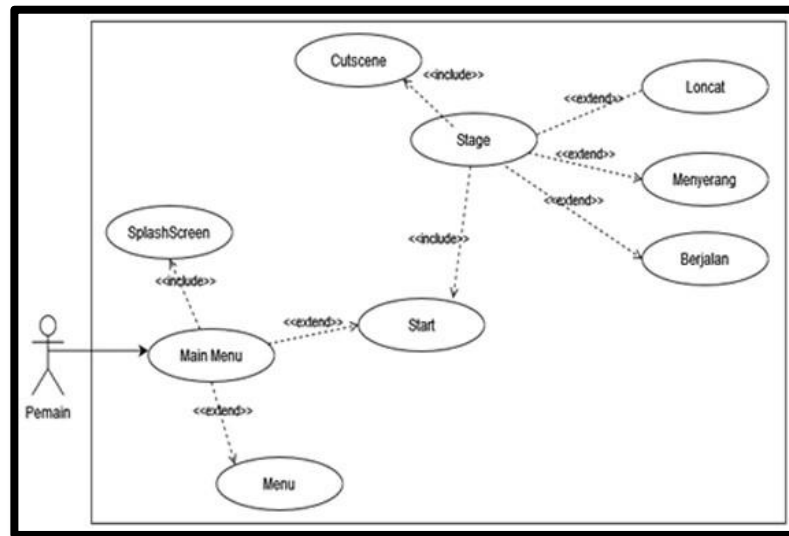
1. Use Case Diagram

Figure 2. Use Case Game Gajah Mada

In the use case diagram shown in Figure 2, there is an actor, the player (user), who is presented with a Splash Screen when opening the application for the first time. After the Splash Screen finishes, the user is taken directly to the Main Menu, where there are options for Start and Menu. If the Menu button is pressed, it will display options to mute the sound and lower the background music volume. If the Start button is pressed, the user is taken to a cutscene. After the cutscene ends, the player (user) is directed to the stage. In the stage, the player can perform actions such as jumping, attacking, and walking.

2. Activity Diagram

Consisting of: Activity Diagram for Splash Screen, Activity Diagram for Main Menu, Activity Diagram for Stage, Activity Diagram for Options, Activity Diagram for Attacking, Activity Diagram for Jumping, Activity Diagram for Walking. Below is an example of an activity diagram.
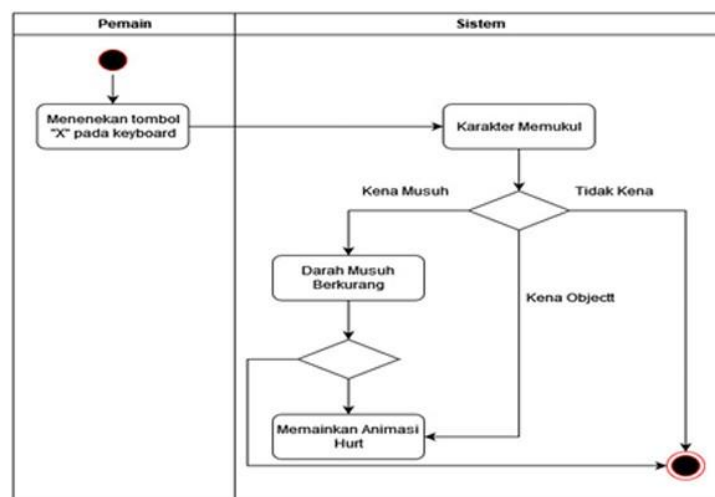

Figure 3. Activity Diagram for Attacking.

In the Attacking Diagram above, it explains that when the player presses the X button, the system commands the game character to play the attack animation, and if the attack hits an enemy, the enemy's health decreases, followed by the enemy playing the hurt animation.
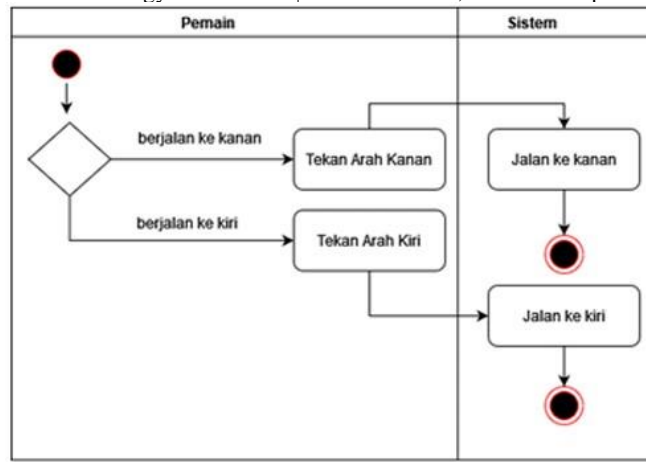
Figure 4. Activity Diagram for Walking.

In the Jumping Diagram above, it explains that when the right arrow is pressed, the character plays the animation and moves to the right. If the left arrow is pressed, the character walks to the left.

3.3.2 User Interface Design

To facilitate user interaction with the system, a visual interface is needed to assist users in providing input and viewing output results. Below are the user interface designs for the system that the author has created: 1. Splash Screen, 2. Home Page, 3. Cutscene Page, 4. Game Stage Page, 5. Game Pause Page, dan 6. Mission Display Page. Below are several examples of the existing user interfaces.
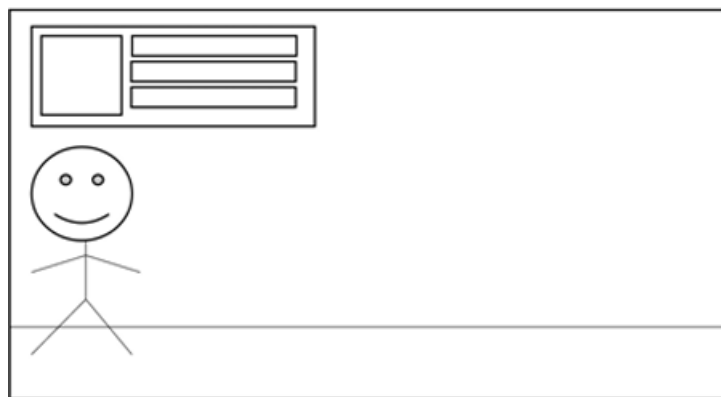

Figure 5. User Interface Design for Stage Gameplay.

Figure 5 is an example of the user interface design, and the image illustrates the design for the stage gameplay interface.
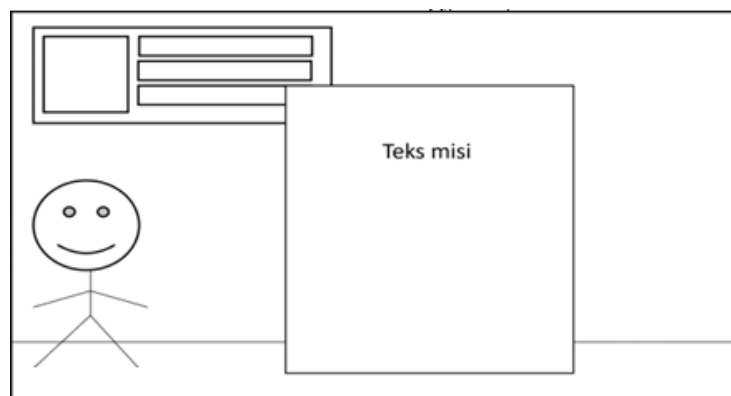

Figure 6. User Interface Design for Mission Text.

3.4 System Implementation

At this stage, the author will explain the hardware and software used to implement the designed system. Additionally, the author will describe the results of the system implementation.

3.4.1 System Implementation Results

The author played the Gajah Mada Game using a Lenovo V330 laptop. Below are the screenshots from the Gajah

Mada history game: 1. Main Menu Page, 2. Cutscene Page, 3. Stage 1 Page, 4. Stage 2 Page, 5. Stage 3 Page, 6. Stage 4 Page, 7. Pause Page, dan 8. Mission Display Page.
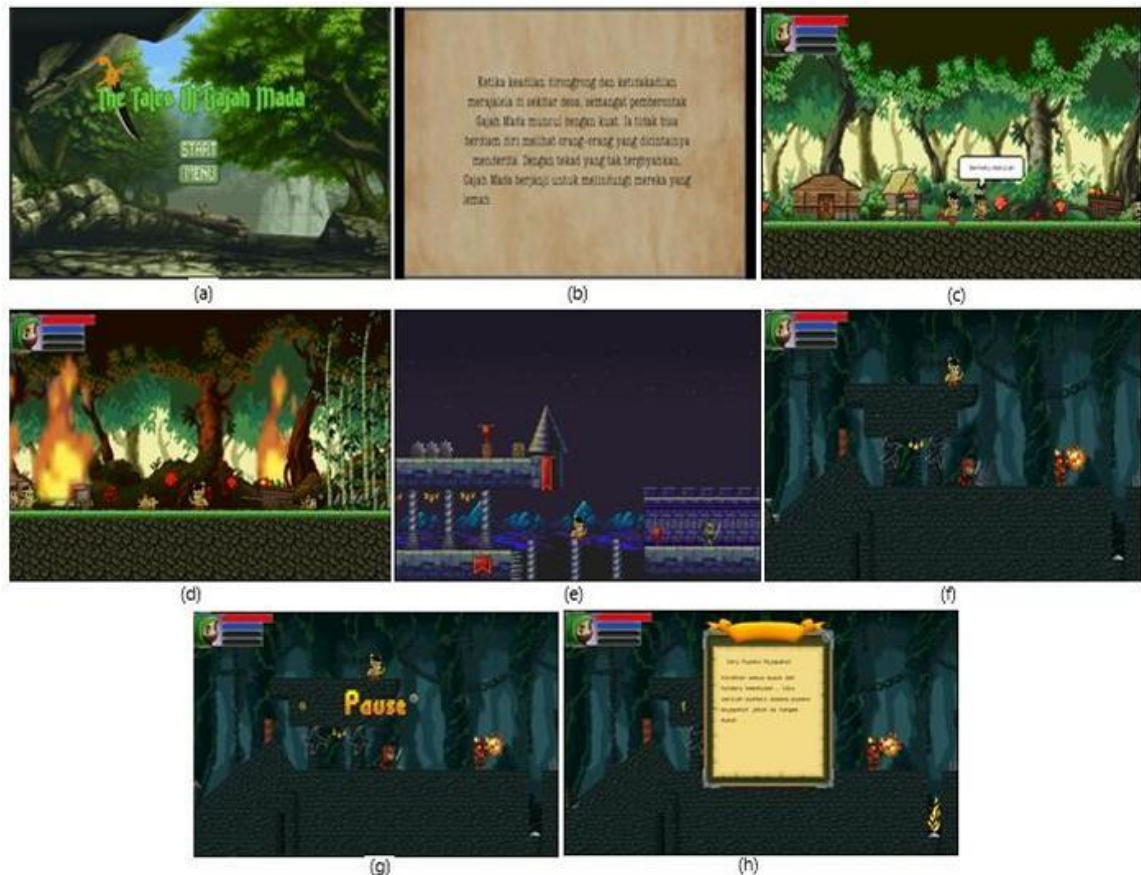

Figure 7. a. Main menu, b. Cutscene, c. Stage 1, d. Stage 2, e. Stage 3, f. Stage 4, g. Pause, h. Misi

3.5 Testing

The testing phase is the stage for evaluating several main functions within the game to determine whether these functions operate as expected. The testing conducted on The Tales of Gajah Mada game was an alpha test. In this testing, the author directly tested the game by executing all game functions and documenting the results in a table. Below is the table of alpha test results.

Table 1. Alpha Testing of the Main Menu

Kasus uji	Langkah pengujian	Hasil yang diharapkan	Hasil uji
Tombol *Start*	Tekan tombol icon *Start*	Menampilkan cutscene narasi yang menandakan *Game* dimulai	Berhasil
Tombol Option	Tekan tombol icon option	Menampilkan menu setting	Berhasil
Tombol Exit	Tekan tombol icon Exit	Mengeluarkan Program	Berhasil

In Table 1, the tested items include the Play, Option, and Exit buttons in the game's main menu. These buttons have been tested and functioned successfully.

Table 2. Alpha Testing of Cutscene.

Kasus uji	Langkah pengujian	Hasil yang diharapkan	Hasil uji
Tombol Skip	Tekan tombol icon Skip	Melewati cutscene untuk melanjutkan permainan	Berhasil

Next, in Table 2, the button being tested is the skip button, which functions to skip the ongoing cutscene.

Table 3. Alpha Testing of Stage.

Kasus uji	Langkah pengujian	Hasil yang diharapkan	Hasil uji
Background Parallax	Memainkan Permainan	Background akan mengikuti player saat bergerak	Berhasil
Tombol Kiri	Tekan Tombol kiri	Player akan bergerak ke kiri	Berhasil
Tombol Kanan	Tekan Tombol kanan	Player akan bergerak ke kanan	Berhasil
Tombol Lompat	Tekan Tombol Space	Player akan melompat	Berhasil
Tombol *Attack*	Tekan Tombol X	Player akan menyerang	Berhasil
Tombol Pause	Tekan Tombol P	*Game* dapat berhenti dan muncul menu pause	Berhasil

In Table 3, the author tests the game stage, which contains several buttons, including those for moving left and

right, jumping, attacking, and pausing. Each of these buttons successfully passed the tests.

Table 4. Alpha Testing of the Pause Menu.

Kasus uji	Langkah pengujian	Hasil yang diharapkan	Hasil uji
Tombol Exit	Tekan tombol icon Exit	*Game* dapat berjalan kembali	Berhasil
Tombol Back To *Main menu*	Tekan tombol icon *Main menu*	Memasuki kembali Menu Utama	Berhasil

Then, for Table 4, the author tested the pause menu. The pause menu includes buttons such as resume and back to the main menu. Each of these buttons passed the testing successfully. It can be concluded that the alpha testing, which covers all functions or buttons in the game, has met the design specifications.

Table 5. Alpha Testing of the Game Stage.

Kasus uji	Langkah pengujian	Hasil yang diharapkan	Hasil uji
Background Parallax	Memainkan Permainan	Background akan mengikuti player saat bergerak	Berhasil
Tombol Kiri	Tekan Tombol kiri	Player akan bergerak ke kiri	Berhasil
Tombol Kanan	Tekan Tombol kanan	Player akan bergerak ke kanan	Berhasil
Tombol Lompat	Tekan Tombol Space	Player akan melompat	Berhasil
Tombol Projectiles	Tekan Tombol Enter	Player akan mengeluarkan sebuah bambu runcing	Berhasil
Tombol Pause	Tekan Tombol pause	*Game* dapat berhenti dan muncul menu pause	Berhasil

4. DISCUSSION

The following points in the discussion may serve as suggestions for enhancing the usability of the historical game: a. For future development, consider adding animations and additional functions, such as climbing or other actions; and b. For future development, consider allowing the main character to change weapons.

5. CONCLUSION

In this research, it can be concluded that: a. Integrating complex historical content into the "Gajah Mada" game using the Rapid Application Development (RAD) method is a smart and effective approach to creating an educational and entertaining experience. b. The historical game "Gajah Mada," developed using the Rapid Application Development method, can enhance students' interest in learning history.

REFERENCES

[1] Prakash, Edmond & Brindle, Geoff & Jones, Kevin & Zhou, Suiping & Chaudhari, Narendra & Wong, Kok. (2009). *Advances in Games Technology: Software, Models, and Intelligence. Simulation & Gaming*. 40. 10.1177/1046878109335120.

[2] Said Romadlan, Mukhlis Muhammad Maududi (2022). *Overcoming the Impact of Online Games through Literacy for Junior High School Students in South Tangerang City*. SPEKTA Vol. 3. No 1, June 2022 pp. 59-70.

[3] Spence, Ian & Feng, Jing. (2010). *Video Games and Spatial Cognition. Review of General Psychology*. 14. 92-104. 10.1037/a0019491.

[4] Habgood, Jacob. (2007). *The Effective Integration of Digital Games and Learning Content*.

[5] Arif Saefudin, Wasino, Susanto, Akhmad Arif Musadad (2022). *Heroism-Based History Learning As An Ideal Model Of Indonesian Human Character: Is It Possible?*. Science, Engineering, Education, and Development Studies (SEEDS): Conference Series Vol.6 No.2, pp 112-118.

[6] Nia Ulfia Krismawati,Warto,Nunuk Suryani. (2018). *The Teacher's Perception Of Developing Teaching Materials Of Local History By Critical Pedagogy Approach In SMAN 3 Ponorogo*. The 2nd International Conference on Technology, Education, and Social Science 2018 (The 2nd ICTESS 2018), pp 141-146.

[7] Alfa Ardiansyah, Abdul Syukur, Kurniawati. (2021). *The Use of Historical Sources in History Learning*. Proceeding ICHELSS 2021, March 25-27, pp 31-37.

[8] Dale H. Schunk. (2012). *Learning Theories An Educational Perspective* Sixth Edition. Pearson. ISBN-10: 0-13-707195-7 ISBN-13: 978-0-13-707195-1.

[9] Agus Aris Munandar. (2020). *Majapahit And The Contemporary Kingdoms: Interactions And Views*. Berkala Arkeologi. Volume 40 No. 1, May 2020, pp 1-22. DOI: 10.30883/jba.v40i1.522.

[10] Catrini Kubontubuh and Peter Carey. (2014). *Majapahit: Inspiration For The World*. Yayasan Arsari Djojohadikusumo. First Edition: November 2014. ISBN: 978-602-70039-3-4.

[11] Ismail Ali and Singgih Tri Sulistiyono. (2020). *A Reflection of "Indonesian Maritime Fulcrum" Initiative: Maritime History and Geopolitical Changes*. Journal of Maritime Studies and National Integration 4 (1) 2020: 12-23 | E-ISSN: 2579-9215.

[12] Gatot Sarmidi, Suryantoro. [2020]. *The Power of the King of Java in the Indonesian Novel*. Proceedings of the 2nd Annual Conference on Social Science and Humanities (ANCOSH 2020). vol 542. pp 225-229.

[13] Winny Ardhian Septiko, Muhammad Aminul Akbar, Tri Afirianto. (2018). *Pengembangan Game Edukasi Platformer Kisah Gajah Mada Menyatukan Nusantara Menggunakan Metode Iterative With Rapid Prototyping*. J-PTIIK. Vol. 2, No. 12, Desember 2018, hlm. 5983-5989.

[14] Pratama, Dendi & Wardani, Winny & Taufiq, Akbar. (2018). *Representation of the Glorious Era of Majapahit Through the Choice of Characters in Visual Novel Game Designs*. 10.2991/reka-18.2018.18.

[15] Riri okra. (2023). *The development of educational game-based learning media in natural science subject for elementary school students*. Jurnal Inovasi Teknologi Pendidikan Volume 10, No. 2, June 2023 (122-132). Online: http://journal.uny.ac.id/index.php/jitp.

[16] Bayu Prakoso Dirgantoro. (2021). *Learning History Through Augmented Reality*. Journal of Game, Game Art and Gamification Vol. 06, No. 01, pp 14-20.

[17] Susheela Hooda Vandana Mohindru Sood Yashwant Singh Sandeep Dalal and Manu Sood. (2023). *Agile Software Development Trends, Challenges and Applications*. This edition first published 2023 by John Wiley & Sons, Inc., ISBN 978-1199639-5.

[18] Faisal. (2022). *Game Visual Novel Dengan Metode Rapid Application Development (Rad) Berbasis Mobile Learning*. Skripsi UPB.

[19] I Gusti Ayu Agung Omika DEWI. (2021). *Understanding Data Collection Methods In Qualitative Research: The Perspective Of Interpretive Accounting Research*. Journal of Tourism Economics and Policy Volume: 1 Number: 1 Page: 23 - 34 ISSN 2775-2283 (print) https://journalkeberlanjutan.com/index.php/jtep.