Journal of Information Systems and Informatics
Vol. 7, No. 3, September 2025 e-ISSN: 2656-4882 p-ISSN: 2656-5935
DOI: 10.51519/journalisi.v7i3.1161 Published By DRPM-UBD

Application of Life Simulation Games in Teaching Network Security and Cryptography

Agusta Rakhmat Taufani[1,4], Tri Retnaningsih Soeprobowati[2], Catur Edi Widodo[3]

[1,2,3]Doctoral Program of Information System, Universitas Diponegoro, Semarang, Indonesia
[4]Department of Electrical Engineering and Informatics, Universitas Negeri Malang, Malang, Indonesia
Email: [1]artfani@students.undip.ac.id, [2]trsoeprobowati@live.undip.ac.id, [3]caturediwidodo@lecturer.undip.ac.id, [4]agusta.rakhmat.ft@um.ac.id

Abstract

Information security-related mathematical methods are used in the science of cryptography. A collection of methods that offer information security, cryptography is more than just a means of concealing messages. Using only presentation slides or video links at each meeting, the interaction between lecturers and students via SIPEJAR e-learning hinders the Network Security and Cryptography learning process at the State University of Malang (UM) Information Engineering (TI) Undergraduate Study Program. To help students learn more about the area of encoding using SIPEJAR, a game that explicitly explains cryptography was created using these several challenges as the background. The creation of a cryptographic life simulation game is intended to serve as a teaching and learning aid for lecturers and students. Students are expected to better understand related material in a learning atmosphere that is new, more interesting, opens the horizons of the mind, and is more investigative. After going through the equivalence partitioning testing process, in general this system produces a total percentage of 100% in system item test success in the testing process of the 6 item tests carried out and a respondent satisfaction percentage of 84.3%. Thus, the system is running according to the prototype design.

Keywords: cryptography, life simulation game, e-learning

1. INTRODUCTION

Cryptography is a field rooted in mathematical techniques that are essential for safeguarding information. It's more than just the art of concealing messages; it encompasses a comprehensive set of methods designed to ensure the confidentiality, integrity, and authenticity of data [1]. Within the context of the Network Security and Cryptography course in the S1 Informatics Engineering (TI) program at Universitas Negeri Malang (UM), students are introduced to these core principles. However, the current delivery of course material through the SIPEJAR

e-learning platform presents a challenge. Interaction between lecturers and students tends to be static and repetitive, often limited to presentation slides or embedded video links, which can lead to disengagement and reduced comprehension.

To address these issues, the development of a game-based learning tool focused on cryptography has emerged as a creative and pedagogically sound solution. The game is designed to help students understand encryption concepts more effectively by embedding them in a dynamic, interactive environment within SIPEJAR. SIPEJAR itself is a digital-based Learning Management System (LMS) used by UM's academic community, offering a platform for both lecturers and students to engage in digital learning experiences [2].

Several important studies inform this initiative. One such study explores a life simulation game that allows players to experience being sheep farmers using real-world data, creating a compelling and immersive educational experience [3]. Another study evaluates the use of the Vigenère cipher in encryption applications. It found that while manual and application-based results were consistent, online versions showed irregularities in keyword repetition and ciphertext generation [4]. These findings underscore the necessity for accurate, intuitive tools in cryptographic education.

Furthermore, current research on cybersecurity education in higher learning institutions highlights the critical need for innovative teaching models [5]. Gamification and AI integration are among the emerging frameworks designed to enrich curriculum and enhance student engagement. These studies suggest that game-based learning significantly improves comprehension of complex cryptographic concepts, especially when visualization tools are used to simplify mathematical representations [6].

Classical ciphers such as Caesar, Vigenère, Playfair, and Enigma [7] are foundational elements included in the cryptography life simulation game. Students engage with these techniques through role-play and real-life scenarios simulated within the game environment [8]. This immersive approach transforms traditional instruction into a narrative-driven learning experience, allowing students to explore the abstract world of cryptography in an engaging, meaningful way.

Ultimately, this game is developed not just as a supplementary tool, but as a core instructional medium that supports both teaching and learning. It provides a new dimension to the educational atmosphere—more engaging, exploratory, and stimulating—especially when compared to the conventional use of SIPEJAR, which often limits student interaction to downloading materials or completing exams. Through gamified media, students are more likely to retain knowledge, stay

motivated, and develop a deeper understanding of cryptographic principles in a relaxed yet academically valid setting.

2. METHODS

This study adopts a Research and Development (R&D) approach [9] utilizing the ADDIE development model, which includes four main stages adapted for this research: Analysis, Design, Development, and Evaluation. The ADDIE model was selected for its systematic structure, making it highly suitable for the creation of educational products such as instructional games [10]. The objective of this study is to design and implement a life simulation game that enhances the teaching and learning of cryptography within the "Network Security and Cryptography" course in the S1 Informatics Engineering (TI) program at Universitas Negeri Malang (UM). Figure 1 maps the integration of the R&D process with the stages of ADDIE, illustrating how each stage contributes to the game development lifecycle.

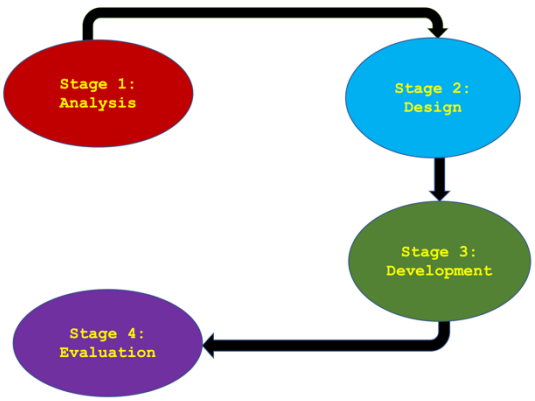

Figure 1. Mapping the R & D Method with the ADDIE Development Model

In the Analysis phase, a comprehensive problem assessment was conducted to identify the limitations of the current learning system. One key issue identified was the reliance of the SIPEJAR e-learning platform on static learning materials such as presentation files and video links, as illustrated in Figure 2. This one-dimensional delivery method fails to engage students or facilitate deep understanding, resulting in inconsistent and often superficial learning outcomes [11]. Another critical gap found during this phase was the absence of interactive media, particularly game-based learning tools, for teaching classical cryptographic concepts. While topics like Caesar, Vigenère, and Playfair ciphers are part of the curriculum, they are not supported by immersive or practical learning experiences. Previous studies confirm that game-based media not only improve student motivation but also significantly enhance the effectiveness of knowledge absorption in educational settings [12].

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

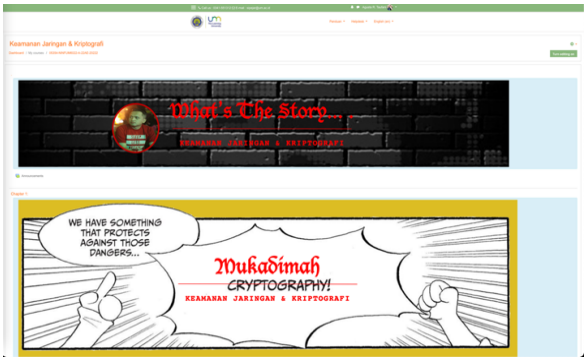

Figure 2. SIPEJAR e-learning for the Network Security and Cryptography course

Following the analysis, the Design phase focused on conceptualizing a game that meets both instructional and technological requirements. The design process began with defining the game's narrative structure, level progression, and educational objectives. A storyline was developed to simulate real-world scenarios involving encryption and decryption challenges, allowing students to apply theoretical knowledge in a meaningful context. Game mechanics were carefully designed to increase in difficulty as the player progresses, mirroring the growing complexity of cryptographic concepts. Special attention was given to creating an intuitive and interactive user interface to ensure ease of navigation. This stage was informed by established principles of instructional design and multimedia learning, ensuring that educational content is effectively integrated into the game environment [13][14]. The outputs from this stage included comprehensive storyboards, interface wireframes, and gameplay prototypes, all of which served as guiding materials for the subsequent development phase.

The Development stage involved transforming the design blueprints into a functioning educational game. At this stage, all game components—such as visual assets, characters, background environments, scripts, and quizzes—were created and integrated. The development process also involved scripting narrative dialogues, constructing cryptographic puzzles, and embedding feedback systems to support adaptive learning. Once the prototype was completed, it underwent a two-tiered testing process. First, subject matter experts in both cryptography and educational technology reviewed the game for accuracy, content validity, and instructional alignment. Then, the game was tested with a pilot group of students enrolled in the S1 TI UM program. This testing aimed to uncover usability issues, content misunderstandings, or technical bugs. Student feedback was collected through surveys and informal interviews, which informed iterative refinements of the game [15].

In the final Evaluation stage, both formative and summative assessments were conducted to measure the game's overall effectiveness. The formative evaluation took place throughout development and was primarily focused on functionality testing and user experience improvements. In the summative evaluation, the completed game was evaluated against its educational goals. This included reviewing system performance, measuring student engagement, and analyzing learning outcomes using both qualitative and quantitative methods. The game's content was assessed for accuracy and pedagogical impact, ensuring it met curriculum standards and learning objectives. Feedback from students and experts was analyzed to identify areas needing enhancement. Revisions were made to improve clarity, interactivity, and the educational depth of the game content [16]. This rigorous evaluation process ensured the final product was not only technically sound and pedagogically effective but also engaging and accessible to the intended student audience.

3. RESULTS AND DISCUSSION

3.1. Life Simulation Game

The final product of this research is the successful design and implementation of a life simulation game-based instructional system for the *Network Security and Cryptography* course in the S1 Informatics Engineering (TI) program at Universitas Negeri Malang. This system integrates pedagogical content with interactive gameplay, aiming to create a more engaging and effective learning environment for students. The assets used throughout the development are documented in a series of figures, beginning with the visualization of character elements in Figure 3, which showcases the game's primary virtual character. These characters serve as interactive avatars that help immerse players into cryptographic scenarios, making abstract concepts more relatable and comprehensible [17], [18].

Figure 3. Character Virtual of the Network Security and Cryptography Game

Figure 4 presents the background design of the main menu, which forms the first visual engagement point for users when launching the game. The audio environment is equally considered, incorporating background music sourced from YouTube, saved in the .ogg format for compatibility [19], [20]. The narrative and dialogue scripting—key components for storytelling within the simulation—are influenced by both personal insights and established cryptography references [21], ensuring relevance and pedagogical alignment. The tone and language of the dialogues are shaped to resonate with students, drawing from communicative trends and vocabulary that reflect the campus learning culture [22].

Figure 4. Main Menu Background of the Network Security and Cryptography Game

Figure 5. Main Menu of the Network Security and Cryptography Game

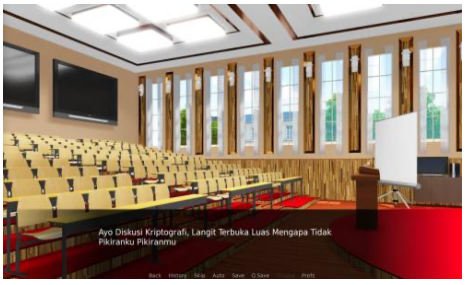

Figure 6. Narrative and Conversation Menu of the Network Security and Cryptography Game

Figure 7. Save and Load Menu of the Network Security and Cryptography Game

The game was developed using the Ren'Py game engine, which is well-suited for creating visual novel-style educational games. As seen in Figure 5, the main menu interface includes several functional buttons such as *Start*, *Load*, *Preferences*, *About*, *Help*, and *Quit*. Each button is programmed to direct users to various gameplay and configuration options, facilitating smooth user interaction [23]. Further, Figure 6 illustrates the dialogue and narrative interface, where players read conversations, receive instructions, and view related visuals and character images. This screen is central to the delivery of educational material in an engaging story-driven format.
To enhance usability, the game incorporates a *Save* and *Load* system, depicted in Figure 7, allowing users to pause gameplay and resume from the same point later.

This feature supports flexible learning, especially when students are interrupted or need multiple sessions to complete game levels. In order to verify that each of these features functioned as intended, a functional testing phase was conducted using the equivalence partitioning method [24]. This involved both valid and invalid data scenarios to confirm the robustness of the system.

Table 1. System Functional Testing Table

Test Item	Valid
Main Menu Access	√
Dialogue Menu Access	√
Save Menu Access	√
Load Menu Access	√
Start Menu Access	√
Quit Menu Access	√

The results of the functional testing are presented in Table 1, which outlines the performance of six core features of the application. All six features—including menu access, dialogue functions, and save/load options—performed successfully, yielding a 100% success rate in the testing process. There were no recorded failures or system errors during this phase, confirming the software's compliance with development and usability standards. The success rate is quantitatively expressed as: (1) Test item success percentage = (6/6 × 100%) = 100%, (2) Test item failure percentage = (0/6 × 100%) = 0%. These results indicate that the game meets critical software validity benchmarks and is functionally ready for educational deployment.

To complement the system testing, a questionnaire-based evaluation was conducted to assess user satisfaction and effectiveness from the students' perspective. The indicators for evaluation are defined in Table 2, which assigns a numerical value to qualitative responses ranging from Strongly Disagree to Strongly Agree. This scale was used to capture feedback on various aspects of the game, such as its usability, engagement level, clarity of instruction, and educational value [25].

Table 2. Evaluation Indicator

Value	Justification	Abbreviation
5	Strongly Agree	SS
4	Agree	S
3	Neutral	C
2	Disagree	TS
1	Strongly Disagree	STS

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

The responses from 25 student participants are recorded in Table 3, showing a predominantly positive reception across the board. Most students responded with Agree or Strongly Agree indicating high levels of satisfaction and perceived educational benefit. A few responses indicated Neutral suggesting minor areas for improvement, though no significant negative feedback was observed. These responses validate that the simulation game is both pedagogically effective and engaging, aligning with the expectations and learning preferences of students in the targeted course.

Table 3. Respondent Questionnaire Results

Participant	Answer to the Quest				
	1	**2**	**3**	**4**	**5**
1	S	SS	C	S	S
2	SS	S	S	S	S
3	S	S	SS	SS	SS
4	S	C	S	C	S
5	SS	SS	S	C	S
6	SS	S	S	SS	SS
7	S	SS	S	SS	SS
8	C	S	SS	S	C
9	SS	SS	S	S	S
10	C	S	S	C	S
11	S	S	S	S	S
12	SS	S	S	S	S
13	SS	S	SS	S	SS
14	S	SS	SS	S	SS
15	SS	S	SS	S	SS
16	S	S	S	SS	S
17	C	SS	S	SS	SS
18	C	C	SS	S	S
19	S	S	SS	C	S
20	SS	S	SS	S	S
21	S	C	C	S	S
22	S	SS	S	S	SS
23	S	S	S	SS	S
24	SS	S	S	SS	S
25	S	SS	S	S	SS

3.2. Discussion

The successful development of a life simulation game for the Network Security and Cryptography course at Universitas Negeri Malang offers a promising model for enhancing the effectiveness of digital learning through gamified instructional tools. The findings of this research reflect a strong alignment between the intended

educational objectives and the implementation outcomes, as demonstrated by both the system functionality results and student feedback.

From a technical standpoint, the game's design and development using the Ren'Py game engine proved effective in delivering an engaging, visually rich learning experience. Each major component of the game—menu access, dialogue interface, save/load functionality, and user navigation—performed flawlessly during system testing, resulting in a 100% functional success rate. This outcome indicates the stability and usability of the software and affirms its readiness for broader implementation. The equivalence partitioning method used during testing provided a thorough assessment of system robustness by validating behavior under both valid and invalid conditions. The absence of any failed test items suggests a mature level of development, where both user experience and system architecture have been carefully considered and optimized.

Pedagogically, the game succeeded in transforming static cryptographic content into an interactive narrative that promotes active learning. Traditional delivery methods—such as presentation slides and video lectures—were identified in the analysis phase as insufficient in fostering deep understanding, especially given the abstract and mathematical nature of cryptography. By embedding key concepts within a narrative-driven simulation and allowing students to play through real-life scenarios, the game effectively bridges the gap between theory and practice. This immersive format appears particularly well-suited for cryptography education, as it contextualizes complex topics through experiential learning and visual storytelling.

Student feedback, collected through a structured questionnaire, further supports the educational value of the simulation game. The responses revealed that a majority of students rated the game positively across various indicators, including clarity, interactivity, engagement, and educational relevance. Most participants selected Agree or Strongly Agree, reflecting a high level of satisfaction. Even the few Neutral responses did not indicate negative perceptions, but rather areas that could be improved—possibly relating to individual learning preferences or specific gameplay elements. This feedback aligns with previous research that emphasizes the benefits of using game-based media in education, particularly for increasing motivation and enhancing knowledge retention in technical disciplines.

In terms of design effectiveness, the incorporation of characters, dialogue, visual backgrounds, and background music contributed significantly to student immersion. These features collectively simulate a real-world environment where learners can explore cryptographic tasks in an interactive setting. The game's structure—divided into levels that reflect increasing complexity—also mirrors the natural progression of cognitive development in mastering cryptographic concepts. By integrating scaffolding and immediate feedback mechanisms within

gameplay, the application supports independent learning and problem-solving skills.

Furthermore, the game's Save and Load system provides flexibility in learning, allowing students to engage with the material at their own pace. This functionality is particularly relevant in asynchronous learning environments or for learners who may require repeated exposure to reinforce understanding. The emphasis on flexible and student-centered learning echoes contemporary educational paradigms, especially in post-pandemic higher education, where digital solutions must be both adaptive and accessible.

The results and subsequent analysis suggest that life simulation games hold substantial potential for improving educational outcomes in technical courses such as cryptography. The integration of narrative, interactivity, and visual design not only enhances engagement but also fosters meaningful learning by situating abstract concepts within a relatable context. Given the positive outcomes of this study, further research could explore expanding the game's content to cover more advanced cryptographic protocols or adapting the framework for other disciplines within computer science and engineering.

Additionally, while the current study focuses on student reception and system functionality, future investigations may benefit from assessing long-term learning gains and comparing them with traditional learning methods. This would offer a more comprehensive understanding of the game's impact on academic performance and conceptual mastery. Nevertheless, the initial results are encouraging and support the continued integration of simulation-based learning tools in higher education curricula, particularly for complex and technical subject matter.

4. CONCLUSION

The life simulation game developed for the Network Security and Cryptography course has proven effective both technically and pedagogically. System testing showed a 100% success rate, confirming that all core features functioned correctly and met design expectations. This validates the application's reliability and readiness for use in educational settings. Student feedback also supports the game's impact, with an 84.3% satisfaction rate indicating high engagement, improved understanding, and a more interactive learning atmosphere compared to traditional methods. The simulation approach made abstract cryptographic concepts more accessible and enjoyable, aligning well with the goals of the S1 TI program at Universitas Negeri Malang.

Given these results, the game can be integrated into the SIPEJAR e-learning platform as a teaching tool. Future improvements should focus on enhancing the user interface (UI), adding visual and audio elements, and expanding the content to cover additional cryptographic topics. Considering user behavior trends, it is also recommended to develop a mobile version for broader access across iOS and Android platforms. These enhancements will help maximize the game's educational impact and ensure long-term usability in diverse learning environments.

REFERENCES

[1] N. Amalya, D.F. Nasution, M. Sari, and I. Gunawan, "Cryptography and Its Application in Data Security Systems (Kriptografi dan Penerapannya Dalam Sistem Keamanan Data)," *Jurnal Media Informatika(JUMIN)*, vol. 4, No. 2, pp 90-93, June 2023.

[2] W.D. Sulistyo and R. Pratama, "Hybrid Learning Model Through SIPEJAR Content as Learning Innovation in History Education Research Courses," *Jurnal YUPA*, vol. 7, No. 2, pp 102-113, July 2023.

[3] Njoto, E. Liliana. and R. Intan, "Application of a Life Simulation Game for Sheep Farming Using the Fuzzy Method (Aplikasi Game Life Simulation Peternakan Domba Menggunakan Metode Fuzzy)," *Jurnal Infra*, vol. 4, No. 1, pp 7-10, February 2016.

[4] A. Amrulloh and E.I. Ujianto, "Symmetric Cryptography Using the Vigenere Cipher Algorithm (Kriptografi Simetris Menggunakan Algoritma Vigenere Cipher)," *Jurnal CoreIT*, vol. 5, No. 2, pp. 71-77, December 2019.

[5] E. P. Ferrari, A. Wong, and Y. Khmelevsky, "Cybersecurity education within a computing science program - a literature review," in *Proceedings of the 26th Western Canadian Conference on Computing Education, ser. WCCCE '24*. New York, NY, USA: Association for Computing Machinery, 2024.

[6] M. Y. Alghamdi and Y. A. Younis, "The use of computer games for teaching and learning cybersecurity in higher education institutions Research Courses," *Journal of Engg. Research*, vol. 9, No. 3(A), pp. 143-152, September 2021.

[7] J. Simarmata, Sriadhi, and R. Rahim, "Kriptografi; Teknik Keamanan Data dan Informasi," ANDI, 2019.

[8] F. Simajuntak and Micheal, "Designing an FPP Mountain Climbing Life Simulation Game Using the GDLC Method (Perancangan Game FPP Mountain Climbing Life Simulation Menggunakan Metode GDLC)," *CBIS Journal*, vol. 12, No. 01, pp. 1-10, March 2024.

[9] M.F. Wajdi and M. Tandililing, "Implementation of the Research and Development (R&D) Method in Archive Management Application (Implementasi Metode Research and Development (R & D) Pada Aplikasi Pengelolaan Arsip)," *Jurnal Informatika Progres*, vol. 14, No. 1, pp. 33-40, April 2022.

[10] Anyan and A.E. Setyawan, "Development of Educational Games to Improve Vocational High School Students' Learning Outcomes in Informatics Subjects (Pengembangan Game Edukasi Untuk Meningkatkan Hasil Belajar Siswa SMK Pada Mata Pelajaran Informatika)," *Digital Transformation Technology (Digitech)*, vol. 4, No. 2, pp. 806-813, September 2024.

[11] Mira, A. Sabilah, A. Farhan, S. Wahyudi, and A. Lubis, "The Application of PowerPoint Media on Student Learning Outcomes in Elementary Schools (Penerapan Media Power Point Terhadap Hasil Belajar Siswa Di Sekolah Dasar)," *Jurnal Elementary Kajian Teori dan Hasil Penelitian Pendidikan Sekolah Dasar*, vol. 5, No. 1, pp. 41-44, January 2022.

[12] T. Wu, K. Y. Tien, W. C. Hsu, and F. H. Wen, "Assessing the Effects of Gamification on Enhancing Information Security Awareness Knowledge," *Applied Sciences*, vol. 11, No. 1, pp. 1-16, October 2021.

[13] V. J. Aslan and Rizky, "Correlation of Controller and Story to Game Experience in Exergames," *Techno.COM,* vol. 22, No. 1, pp. 45-57, February 2022.

[14] R. A. Sirait and E. Y. Dewi, "The Role of Learning Technology in Learning Design (Peran Teknologi Pembelajaran pada Desain Pembelajaran)," *Jurnal Budi Pekerti Agama Kristen dan Katolik*, vol. 2, No. 4, pp. 232-242, December 2024.

[15] L. Rahmadi, M. Triawan, and M. Rosalena, "Development of the Educational Game "Malaya" for Introducing the Solar System Based on Android at SD Negeri 33 Pagar Alam (Pengembangan Game Edukasi "Malaya" Untuk Pengenalan Tata Surya Berbasis Android Pada SD Negeri 33 Pagar Alam)," *Informatics and Computer Engineering Journal*, vol. 4, No. 2, pp. 53-63, August 2024.

[16] H. A. Hasibuan, Supriadi, S. Zakir, and L. Efriyanti, "Development of Game-Based Evaluation Instruments Using Wordwall in ICT Subjects for Eighth Grade at MTs Yati Kamang Mudik (Pengembangan Instrumen Evaluasi Berbasis Games Menggunakan Wordwall pada Mata Pelajaran TIK Kelas VIII di MTs Yati Kamang Mudik)," *Jurnal Pendidikan Tambusai*, vol. 9, No. 1, pp. 28-37, 2025.

[17] B. P. Blessilla, J. Samodra, and A. Sutrisno, "Asset Design and 3D Game Environment "Road to Campus," *JoLLA: Journal of Language, Literature, and Arts*, vol. 1, No. 9, pp. 1171-1187, 2021.

[18] U. Latifah and N. Kristiana, "Visual Analysis of the Character Gatotkaca in the Game Mobile Legends Bang Bang (Analisis Visual Karakter Gatotkaca dalam Game Mobile Legends Bang Bang)," *VISUALITA*, vol. 9, No. 2, pp. 241-255, April 2021.

[19] H.A. Rosyid, A.R. Taufani, and T.L. Sari, "Evaluation of KNN in Game Background Music Categorization (Evaluasi KNN dalam kategorisasi Musik Latar Game)," *TEKNO*, vol. 32, No. 2, pp. 265-274, September 2022.

[20] M. David, E. Insani, D. Tumangger, and S. Aisyah, "Designing an Educational Mobile Game for Introducing Fruits to Elementary School Students (Perancangan Mobile Game Edukasi Pengenalan Buah-Buahan untuk Sekolah Dasar)," *KESATRIA: Jurnal Penerapan Sistem Informasi (Komputer & Manajemen)*, vol. 2, No. 4, pp. 191-194, October 2021.

[21] R.W. Asiani and I. Yanti, "The application of Caesar Cipher and Hill Cipher cryptography in Sending Secret Messages as a Learning Medium Realistic Mathematics in Modulo Material Method (Penerapan Kriptografi Caesar Cipher dan Hill Cipher dalam Pengiriman Pesan Rahasia Sebagai Media Pembelajaran Matematika Realistik Pada Materi Modulo)," *Baitul 'Ulum: Jurnal Ilmu Perpustakaan dan Informasi*, vol. 6, No. 1, pp. 79-97, June 2022.

[22] R. R. Alfiansyah, P. W. Atmaja, and A. N. Sihananto, "Development of an Educational History Game on the Struggle for Don Bosco Warehouse Based on Narrative Using Interactive Digital Narrative (Pengembangan Game Edukasi Sejarah Perebutan Gudang Don Bosco Berbasis Narasi Menggunakan Interactive Digital Narrative)," *Jurnal Penelitian Teknologi Informasi Dan Sains*, vol. 1, No. 4, pp. 49-61, December 2023.

[23] A. W. Chrisandy, L. Fanani, and M. T. Ananta. "Development of an Android Visual Novel Game Based on the Folktale of Reog Ponorogo Using Renpy to Increase Reading Interest Among Bangunsari 1 Ponorogo Elementary School Students (Pengembangan Gim Android Visual Novel Cerita Rakyat Reog Ponorogo berbasis Renpy untuk Meningkatkan Minat Baca Siswa SD Bangunsari 1 Ponorogo)," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer,* vol. 7, No. 1, pp. 96-101, January 2023.

[24] Yulianti, T. Desyani, R.R. Chaniago, H. Iswanto, E. Suroso, and T.S. Hermanto, "Testing of Web-Based Academic Information System Application Using Equivalence Partitioning Technique and Black Box Method (Pengujian Aplikasi Sistem Informasi Akademik Berbasis Website Menggunakan Teknik Equivalence Partitioning dan Metode Black Box)," *Jurnal Informatika Universitas Pamulang*, vol. 7, No. 1, pp. 145-150, March 2022.

[25] S. W. Sutantri, R. N. Maharani, S. Darma, R. F. Syamsu, and M. A. Jaya, "The Relationship between Playing Online Games and Social Interaction in Elementary School Children at Inpres Tamalanrea 2 Makassar (Hubungan antara Bermain Games Online dengan Interaksi Sosial pada Anak di SD Inpres Tamalanrea 2 Makassar)," *Fakumi Medical Journal: Jurnal Mahasiswa Kedokteran*, vol. 3, No. 11, pp. 806-813, November 2023.