

## CRAFTING AN INTERACTIVE VIDEO GAME COURT SYSTEM FOR MORAL DEVELOPMENT AND LEGAL INSIGHT

Tony Wibowo<sup>1</sup>, Diny Anggriani Adnas<sup>2</sup>, \*Mulyanto<sup>3</sup>, Alberta Adeline Marvel<sup>4</sup>

<sup>1,2,3</sup>Information Systems Study Program, Faculty of Computer Science,  
Universitas Internasional Batam

Address: Baloi-Sei Ladi, Jl. Gajah Mada, Tiban Indah, Kec. Sekupang, Kota Batam, Kepulauan Riau,  
telp. (0778) 7437111

e-mail: <sup>1</sup>[tony.wibowo@uib.ac.id](mailto:tony.wibowo@uib.ac.id), <sup>2</sup>[diny.anggriani@uib.ac.id](mailto:diny.anggriani@uib.ac.id), <sup>3</sup>[2131056.mulyanto@uib.edu](mailto:2131056.mulyanto@uib.edu),  
<sup>4</sup>[2131113.alberta@uib.edu](mailto:2131113.alberta@uib.edu)

### Abstract

*This paper explores the use of the Game Development Life Cycle (GDLC) in creating a hybrid game that integrates visual novel storytelling with match-three puzzle mechanics. The visual novel emphasizes player decision-making and narrative immersion, while the puzzle element adds strategic challenges that propel the story. GDLC's structured phases facilitated efficient teamwork, resource management, and iterative testing throughout development. The findings highlight GDLC's effectiveness in merging diverse game genres, creating an engaging experience for varied audiences. Given the declining popularity of standalone puzzle games, this approach demonstrates how puzzle mechanics can enhance broader gameplay structures, enriching narrative flow and player engagement. The study also examines the challenges of combining visual novels and puzzles, alongside cultural considerations for addressing societal issues in Indonesia. This research underscores GDLC's potential for cross-genre innovation and invites future exploration into player-driven narratives and dynamic content in game design.*

**Keywords:** Video Game, Indonesia's Judicial System, Visual Novel, Match-Three, GDLC

### Abstrak

*Artikel ini membahas penggunaan Game Development Life Cycle (GDLC) dalam menciptakan game hibrida yang mengintegrasikan narasi visual novel dengan mekanik teka-teki match-three. Visual novel menekankan pengambilan keputusan pemain dan imersi dalam narasi, sementara elemen teka-teki menghadirkan tantangan strategis yang mendorong alur cerita. Fase-fase terstruktur dalam GDLC memfasilitasi kerja tim yang efisien, pengelolaan sumber daya, dan pengujian iteratif sepanjang pengembangan. Temuan menunjukkan efektivitas GDLC dalam menggabungkan genre game yang beragam, menciptakan pengalaman yang menarik bagi berbagai audiens. Mengingat menurunnya popularitas game teka-teki sebagai genre mandiri, pendekatan ini menunjukkan bagaimana mekanik teka-teki dapat memperkaya struktur gameplay yang lebih luas, meningkatkan alur cerita, dan keterlibatan pemain. Studi ini juga mengeksplorasi tantangan dalam menggabungkan visual novel dan teka-teki, serta mempertimbangkan aspek budaya untuk mengangkat isu-isu sosial di Indonesia. Penelitian ini menyoroti potensi GDLC untuk inovasi lintas-genre dan mengundang eksplorasi lebih lanjut pada narasi berbasis pemain dan konten dinamis dalam desain game.*

**Keywords:** Video Game, Sistem Peradilan Indonesia, Visual Novel, Match-Three, GDLC

### 1. PRELIMINARY

The field of game development has experienced a significant evolution over the years, with various methodologies and approaches emerging to address the unique challenges faced by game designers and developers[1], [2], [3], [4]. One such approach is the Game Development Life Cycle method, which has gained traction in the industry due to its ability to streamline the game development process and enhance the overall quality of the final product[5]. The GDLC method provides a structured

framework that guides developers through the stages of game development, from initial conceptualization to final release[6]. By breaking down the development process into well-defined phases, the GDLC approach helps teams stay organized, manage resources effectively, and ensure that all critical aspects of game design and implementation are thoroughly addressed. This structured approach allows for better planning, risk mitigation, and efficient collaboration among the various stakeholders involved in the game development project. Moreover, the GDLC method emphasizes the importance of iterative design and testing, enabling developers to gather feedback, identify and address issues, and make data-driven decisions throughout the development cycle[7]. This iterative approach helps to ensure that the final game product meets the intended design goals and delivers a satisfying experience for players[4], [8], [9]. Overall, adopting the GDLC method in the game development industry has been instrumental in driving innovation, improving development efficiency, and enhancing the overall quality of games. As the industry continues to evolve, the GDLC framework remains a valuable tool for game designers and developers seeking to navigate the complexities of modern game development.

The visual novel genre has gained popularity in the gaming community due to its ability to deliver rich narrative experiences and deep character exploration[10][11]. Visual novel games are considered a form of visual communication design, blending graphic design elements like visual style, character creation, and narrative structure with interactive storytelling[11]. Unlike other games, visual novels focus more on choice matters where players will be needed to make choices to reach a certain ending, where these choices could impact the main story, relationship, and multiple endings[12]. These interactive elements not only will engage players on a deeper level in the game but also allows developers to create multiple storylines that challenge the player's perspective and decision-making[12]. This makes the visual novel genre evolve into a versatile platform for entertainment, education, and even social commentary appealing worldwide[12].

The match-tree puzzle genre, on the other hand, has long been a staple in the casual gaming market, offering players a satisfying blend of challenge, strategy, and relaxation[13], [14], [15], [16]. These games often feature branching paths that vary according to player decisions, enhancing emotional connection and immersion. Conversely, puzzle games—especially match-three types—are celebrated for their straightforward mechanics and wide appeal, providing quick satisfaction through pattern matching and strategic moves[17]. While visual novels emphasize narrative depth, puzzle games offer mental challenges and moments of relaxation. Combining these genres into one game introduce both opportunities and challenges, particularly in creating a balanced experience that equally prioritizes story development and engaging gameplay. By applying the GDLC method to the development of these two game genres, we aim to provide valuable insights into the effective integration of storytelling, game mechanics, and player engagement in the context of contemporary game development.

In this research paper, we explore the application of the GDLC method in developing two distinct game genres: a visual novel and a match-tree puzzle game. The visual novel genre, known for its emphasis on storytelling and character development, and the match-tree puzzle genre, with its focus on problem-solving and strategic thinking, present distinct design and development requirements[13]. By leveraging the GDLC framework, we aim to demonstrate how these two different game genres can be effectively developed to create engaging and immersive gaming experiences that cater to diverse player preferences and interests.

## **2. Research Methods**

The Game Development Life Cycle is a widely adopted approach in the game development industry that provides a structured framework for the entire game development process[18]. This method breaks down the development cycle into distinct phases, allowing for better planning, resource management, and collaboration among the development team.

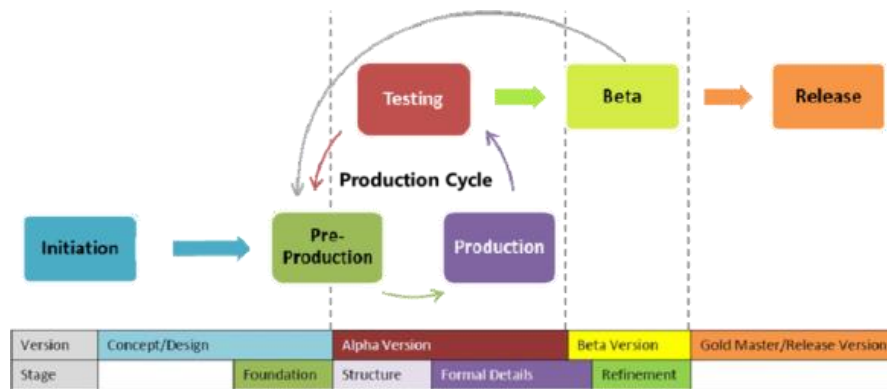


Image 1. GDLC Chart

## 2.1. Pre-Production

This phase of the development process commenced with the implementation of the GDLC framework. Two primary game mechanics were identified for development: the narrative function and the match-three puzzle. The development team was divided into separate groups to work on these distinct mechanics, which would later be integrated.

### 1. Narrative Function

This function generates a box with visual feedback for the reader. This box contains text that narrates a story. Additionally, the narrative function incorporates a choice function, which provides the player with options to select from. This enables the player to freely choose the option that resonates with them most personally.

### 2. Match-three Puzzle

Another programmer will be responsible for the match-three puzzle function. Match-three puzzle games require players to swap or move objects on a grid to create combinations of three or more identical items. Once items are matched, they disappear from the grid and new items fall into the empty spaces. This can potentially lead to chain reactions and the creation of more matches, resulting in higher scores for the player. The game includes specific goals or objectives for the player to achieve within a limited number of moves or a time limit.

## 2.2. Production

In the production phase, the programmers take the foundational work from the pre-production stage and begin integrating the various elements of the game. They combine the narrative and match-tree puzzle functions, ensuring seamless transitions between the story-driven visual novel segments and the challenging puzzle gameplay. The production team also implements all the necessary assets, such as character designs, background art, music, and sound effects, to bring the game world to life and create an immersive experience for the players.

## 2.3. Testing

The testing phase will commence, during which rigorous gameplay, bug, and compatibility testing will be conducted to identify any issues in the game. The court system game will be tested to ensure its functionality, stability, and user experience. Any flaws should be fixed before the next phase.

## 2.4. Release

Finally, in the release phase, the completed game is made available to the public, either through digital distribution platforms or other appropriate channels. The developers remain vigilant, monitoring player feedback and providing regular updates to address any lingering issues or implement improvements based on user experiences. This commitment to post-launch support helps to maintain the game's quality and longevity, ensuring that players continue to enjoy the engaging visual novel.

### **3. RESULT AND DISCUSSION**

#### **3.1 Result research**

The current study has demonstrated the effectiveness of the GDLC approach in creating a comprehensive game that harmonizes a visual novel component, and a match-three puzzle mechanic[13]. The findings suggest that the GDLC framework can successfully facilitate the integration of diverse game genres, resulting in a well-rounded and engaging game that caters to a wide audience[19], [20]. However, the research also suggests that certain game types, such as puzzle games and visual novels, may face challenges in fully integrating all GDLC elements. Visual novels tend to prioritize narrative and character development over gameplay mechanics[21], making it difficult to seamlessly incorporate the structured GDLC framework. Similarly, some puzzle game genres, such as open-ended or procedurally generated puzzles, may not easily fit within the predefined GDLC phases.

The visual novel component, with its focus on storytelling and character development, has been meticulously crafted to immerse players in a rich narrative experience[11], [22], [23]. The narrative function, which allows players to make choices that influence the story's progression, has been seamlessly integrated into the overall game design, ensuring a cohesive and engaging gameplay experience. This narrative-driven approach aligns with the growing popularity of visual novels in the gaming community, as they are known for their ability to deliver captivating stories and deep character exploration.

In the Initiation stage, the development team first analyzed the provided game design to define the necessary programming requirements. Based on this analysis, they identified the need to create a main menu, visual novel game mechanics, and match-three puzzle game mechanics. The development team organized the program's framework to follow the narrative flow of the game, ensuring a seamless integration between the visual novel and puzzle components. After defining these requirements in the Initiation stage, the team proceeded to the next phase of development.

During the Pre-Production stage, the team started programming the game mechanics to ensure the functionality of the game. First, they developed the main menu, where players could access the game and configure the sound settings. For the visual novel component, the development team implemented a multifaceted approach to enhance the narrative experience. They created a text box that serves as the primary medium for conveying the game's storyline, allowing players to visually engage with and comprehend the unfolding narrative. Additionally, they integrated a choice system that empowers players to make meaningful decisions, influencing the progression of the narrative and leading to diverse endings where each choice carries significant weight. This narrative branching mechanic encourages player agency and fosters a sense of personalization, as players can shape the story's trajectory according to their preferences. Furthermore, the developers incorporated a feature that enables players to customize the protagonist's gender and name, further immersing them in the game's world and establishing a stronger connection between the player and the central character.



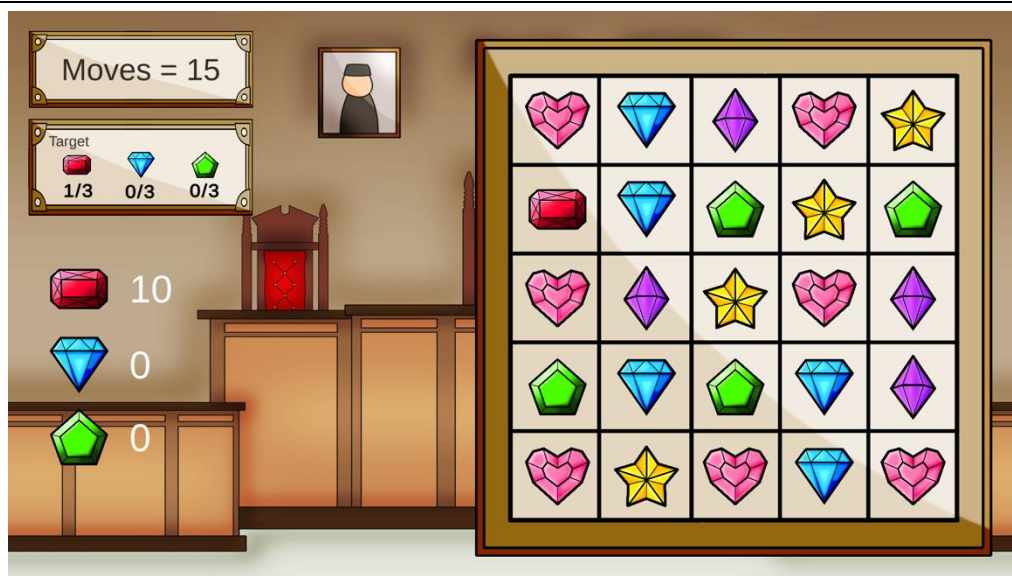
**Image 2.** Visual Novel Game Scene

Finally, they developed the match-three puzzle mechanics, which required creating boxes containing differently colored gems that would be destroyed when matched in vertical or horizontal groups of three or more. During the Pre-Production phase for the match-three puzzle, the development team initially designed the game board, organized into a grid of boxes to serve as the foundation for the puzzle elements. They then randomly populated the grid with variously colored gems to introduce variety in gameplay and challenge players with unpredictable patterns.

Next, the team implemented the core mechanics for swapping adjacent gems on the board, allowing players to move two gems either vertically or horizontally. They also developed the logic for matching gems, where only those aligned in groups of three or more, either vertically or horizontally, could be destroyed. This matching logic is central to the match-three puzzle mechanics, ensuring that each player move initiates a check for matches, leading to the destruction of gems and automatic refilling of the board, maintaining fluid gameplay. Additionally, they designed a mission system where players must destroy a specified number of gems to advance to the next stage. Each stage challenges players to match a certain amount of red, green, and blue gems. Once these targets are reached, the stage is complete, and the player moves on to the next level. This system provides specific challenges for each level, with difficulty gradually increasing.

Once the match-three mechanics were programmed, the development team moved on to integrating the design details from the assets prepared by the design team. These assets included visual components like backgrounds, buttons, and modal pop-ups that deliver information to players, such as success or failure messages. The team made sure these elements were smoothly incorporated into the game, both in terms of functionality and aesthetics. They programmed the assets to fit the overall theme and atmosphere of the game while ensuring smooth performance across multiple devices. This approach enhanced the visual appeal and improved the user interface, providing a more immersive and polished gaming experience.





**Image 3.** Match-Three Puzzle

The integration of visual novel narratives and match-three puzzle mechanics, guided by the Game Development Life Cycle (GDLC) method, has resulted in a compelling gaming experience that appeals to a broad spectrum of players. The GDLC framework allowed the development team to carefully plan each phase, manage resources effectively, and promote collaboration throughout the entire process. This structured approach enabled a smooth blending of the story-driven aspects of visual novels with the engaging and interactive mechanics typical of match-three puzzles[21].

It is crucial to recognize the decreasing popularity of puzzle games as standalone products within the gaming industry[24]. Once a leading genre, puzzle games have lost some appeal in recent years as players gravitate toward more immersive and complex gaming experiences. This shift indicates that players now favor games that integrate puzzle mechanics with other features, like narrative or action elements[24], [25]. Consequently, developers could benefit from incorporating puzzles into broader game structures rather than creating them as separate titles. By embedding puzzles within larger, interactive experiences—such as the match-three mechanic in this game—developers can maintain the allure of puzzle gameplay while meeting modern player expectations for more diverse and layered experiences[25]. This strategy not only adds variety but also ensures that the puzzles play a significant role in advancing the game's progression and providing engaging challenges.

In particular, the narrative component has been designed to provide the players with an immersive and dynamic experience. Where their choices are designed to significantly impact the plot of the game's storyline. The emphasis was created as a responsive narrative system that could adapt in real-time to decisions made by the players. The complexity involved in this production required detailed branching of dialogue trees and multiple endings. Ensuring that each choice is meaningful and has a real effect on the game plot. It's believed that more engagement of interactivity would lead to players having a stronger sense of agency knowing that their actions would impact the plot events.

To further enhance the gameplay experience and introduce a structured challenge for players, a match tree mechanism has also been implemented as a form of entertainment and gatekeeping device[26]. The match tree mechanism is designed to serve multiple functions. Where it engages the player, it provides an interactive puzzle scenario, while also controlling the pace of the narrative by requiring them to complete these challenges before the game can progress to the other story[26]. The inclusion of this mechanism is based on the belief that players will be able to find areas of the game where it's both stimulating and rewarding, thereby maintaining their interest in the overall experience[27].

With the pre-production and production completed, the development team entered the testing phase to ensure the game was polished and playable. During this stage, developer teams actively play the game, exploring the created mechanics, features, and user interface to identify any potential errors or bugs that may have been overlooked. In case errors or bugs appear the team will fix the one that may hinder the game itself first. The goal in testing itself isn't to find obvious glitches but to identify

inconsistencies that could be a hindrance to the whole game itself. By addressing these issues promptly the team will be able to ensure the game achieves a higher level of quality and readiness before it is handed for future external testing.

After completing the testing phase, the team starts to prepare for a beta version of the game to be tested or distributed to a group of game testers. These testers will then begin to evaluate the game, meticulously exploring all of the features, mechanics, and functionality. The game testers' primary goal is to identify bugs, errors, and areas requiring improvement that might be overlooked by the team during production. This stage is critical to uncovering both minor and major glitches in the game, which could impact the overall user experience heavily. The feedback then is reported to the development team which starts to polish and ensure the game is ready for its eventual release.

During the release stage, the team starts to dedicate their time to addressing and resolving bugs identified during the testing phase. These bugs and errors were reported by the game testers, who conducted a thorough investigation of the game to ensure its functionality, stability, and overall user experience. Each issue then is carefully analyzed to understand its root cause, whether it is involved in the gameplay mechanics, visual elements, audio synchronization, or performance optimization. The development team then separates the problem and focuses on the major bugs that are in dire need of being fixed to solve the critical issues that might hinder the player experience. While also addressing the minor bugs to ensure a polished final product. This process not only will improve the technical quality but also the game quality itself as it is reinforced in its reliability and playability, ensuring the final release meets the team standards and the target audience. Looking forward, future research could explore modifications or enhancements to the GDLC method to better facilitate cross-genre game development. This investigation could focus on developing more adaptable frameworks that can accommodate various gameplay styles and narrative structures, ultimately improving the overall game development process. Additionally, further studies into how the GDLC can be successfully integrated with emerging game design trends—such as player-driven narratives, generative content, and adaptive storytelling—could provide valuable insights. These insights would not only enhance the applicability of the GDLC framework across diverse projects but also contribute to the advancement of game design practices that emphasize player agency and innovation. Such developments could significantly influence the gaming industry by enabling the creation of more dynamic and interactive gaming experiences that resonate with modern audiences.

Additionally, the research revealed obstacles to utilizing video games as a medium for addressing complex issues in Indonesia. It is imperative to consider the following factors: the perception of video games and moral and religious sensitivities. It has been brought to our attention that the perception of video games in Indonesia does not currently view them as a form of educational or awareness tool. Conversely, a considerable proportion of the population continues to view video games as a medium that is solely intended for entertainment and as an unproductive expenditure of funds. This perception engenders resistance to the utilization of video games for the resolution of significant issues, including those pertaining to politics, social justice, and environmental concerns. However, it has come to our attention that soon, video games may be regarded as an educational medium in Indonesia. For this to occur, it is recommended that public awareness campaigns be conducted, such as those that involve partnerships with educational institutions, including schools and universities, as well as non-governmental organizations (NGOs). This could facilitate the legitimization of the utilization of video games as a conduit for the discussion and engagement with intricate matters.

Furthermore, Indonesia is home to a diverse population with strong moral, religious, and traditional beliefs. Consequently, should a video game address intricate social or political matters, it may be subjected to scrutiny if perceived as challenging or disrespectful to these values. It is incumbent upon game developers to exercise caution and sensitivity regarding cultural and religious sensitivities, particularly in the context of narrative and gameplay design. It would be prudent to engage with community leaders and religious scholars during the development process, to ensure that the content remains respectful and appropriate for the local audience.

Ultimately, by addressing the limitation and exploring the enhancement to the GDLC framework, future research can pave the way for more tools to enable more versatile and innovative game development. The current study demonstrates GDLC's effectiveness in structuring the development of visual novel games, and incorporating elements such as match-tree puzzle games. It also reveals areas for improvement. For instance, the framework can pose a challenge when integrating dynamic, player-

driven mechanics or complex branching narratives. These limitations highlight the need to have more adaptable models that cater to much more diverse gameplay styles and narrative structures. The enhancement to the GDLC could focus on creating modular, flexible systems that align with evolving design trends, such as generative storytelling and personalized player experience. Such advancement would not only expand the framework's applicability across more game genres but also contribute to refining game design practice as a whole with a sturdy structure. By promoting innovation and embracing the complexity of modern games, future research can ensure that frameworks like GDLC remain relevant and impactful in a rapidly changing industry.

### 3.2 Discussion

The game's success can be attributed to the developers' meticulous attention to detail and their commitment to delivering a polished and cohesive experience. As the game continues to evolve and receive post-launch support, the development team remains steadfast in their dedication to enhancing the player experience and addressing any emerging needs or feedback from the community. This unwavering commitment to ongoing refinement and improvement further solidifies the game's position as a trailblazer in the realm of cross-genre game development. Looking ahead, the success of this game sets a precedent for future endeavors that aim to push the boundaries of genre-blending and player engagement.

Researchers and industry professionals may find value in exploring modifications or enhancements to the GDLC method, with a focus on developing more adaptable frameworks that can accommodate a wider range of gameplay styles and narrative structures. Additionally, investigating the integration of the GDLC with emerging game design trends, such as player-driven narratives, generative content, and adaptive storytelling, could provide valuable insights that further improve the applicability and effectiveness of this development approach. Such developments could significantly influence the gaming industry by enabling the creation of more dynamic and interactive gaming experiences that resonate with modern audiences. Ultimately, the game developed in this study stands as a testament to the potential for innovative cross-genre experiences in the gaming industry.

## 4. RESEARCH RESULT

The game developed in this study represents a successful and innovative fusion of visual novel storytelling and match-three puzzle mechanics, delivering a compelling and multifaceted gaming experience. The visual novel narrative component immerses players in a rich, branching storyline, fostering deep emotional connections with the characters and enabling them to shape the trajectory of the plot through their meaningful choices. Concurrently, the seamlessly integrated match-three puzzles mechanics introduce strategic gameplay challenges that are tightly woven into the narrative progression, ensuring that each successful match feels impactful and rewarding within the overarching context. This harmonious integration of narrative and gameplay, facilitated by the GDLC framework, has resulted in a well-rounded and engaging game that caters to a diverse audience. The visual novel's captivating storytelling and character development, combined with the accessible yet challenging match-three puzzle elements, provide players with a unique and immersive gaming experience that keeps them motivated and invested throughout their journey.

## References

- [1] T. Wibowo and E. Hermanto, "Development of Global Warming Themed Video Games: Implementation of Game Development Life Cycle (GDLC) Framework," *The 2nd Conference on Management, Business, Innovation, Education, and Social Science (CoMBInES)*, vol. 2, no. 1, pp. 365–372, 2022.
- [2] R. Jordy, H. Marcos, J. Wijaya Kusuma, and D. Intan Surya Saputra, "Mobile game design for elementary school mathematics educative games," *Journal of Soft Computing Exploration*, vol. 4, no. 2, pp. 69–78, 2023, doi: <https://doi.org/10.52465/josce.v4i2.129>.
- [3] S. Syarif, T. Hasanuddin, and M. Hasnawi, "Perancangan Game Puzzle Labirin menggunakan Metode Game Development Life Cycle (GDLC) berbasis Unreal Engine," *Buletin Sistem Informasi dan Teknologi Islam*, vol. 3, no. 1, pp. 34–41, 2022, doi: <https://doi.org/10.33096/busiti.v3i1.582>.



- [4] S. N. Huda and M. F. Ramadhan, "Designing Educational Game to Increase Environmental Awareness," *International Journal of Emerging Technologies in Learning*, vol. 16, no. 15, pp. 181–193, 2021, doi: 10.3991/ijet.v16i15.22661.
- [5] A. Aziz and R. Fauzi, "Penerapan BYL's GDLC pada Perancangan Aplikasi Game Edukasi Pengenalan Hewan," *Computer and Science Industrial Engineering (COMASIE)*, vol. 7, no. 2, pp. 109–116, 2022, Accessed: Oct. 01, 2024. [Online]. Available: <http://ejournal.upbatam.ac.id/index.php/comasiejurnal>
- [6] S. Wahyu, "Penerapan Metode Game Development Life Cycle Pada Pengembangan Aplikasi Game Pembelajaran Budi Pekerti," *SKANIKA: Sistem Komputer dan Teknik Informatika*, vol. 5, no. 1, pp. 82–91, 2022, doi: <https://doi.org/10.36080/skanika.v5i1.2904>.
- [7] P. Formosa, M. Ryan, S. Howarth, J. Messer, and M. McEwan, "Morality Meters and Their Impacts on Moral Choices in Videogames: A Qualitative Study," *Games Cult*, vol. 17, no. 1, pp. 89–121, Jan. 2022, doi: 10.1177/15554120211017040.
- [8] J. Lasmana Putra and C. Kesuma, "Penerapan Game Development Life Cycle Untuk Video Game Dengan Model Role Playing Game," *Computer Science (CO-SCIENCE)*, vol. 1, no. 1, pp. 27–34, 2021, doi: <https://doi.org/10.31294/coscience.v1i1.158>.
- [9] R. Roedavan, B. Pudjoatmodjo, Y. Siradj, S. Salam, and B. Q. D. Hardianti, "Serious Game Development Model Based on the Game-Based Learning Foundation," *Journal of ICT Research and Applications*, vol. 15, no. 3, pp. 291–305, Dec. 2021, doi: 10.5614/ITBJ.ICT.RES.APPL.2021.15.3.6.
- [10] K. Oygardslia and J. Shin, "The Educational Potential of Visual Novel Games: Principles for Design Charlotte Laerke Weitze Digital and Creative Learning Lab," *Replaying Japan*, vol. 2, Mar. 2020, [Online]. Available: <https://www.researchgate.net/publication/341380379>
- [11] J. Camingue, E. F. Melcer, and E. Carstensdottir, "A (Visual) Novel Route to Learning: A Taxonomy of Teaching Strategies in Visual Novels," in *ACM International Conference Proceeding Series*, Association for Computing Machinery, Sep. 2020. doi: 10.1145/3402942.3403004.
- [12] S. Kar, "THE IMPACT OF VISUALS ON STORYTELLING IN VISUAL NOVELS," 2023.
- [13] N. Bt. Ramlan and N. Bt. Fabil, "The Importance of Game Development Framework (GDF): Proposing an Islamic Game Development Framework with Sustainability Features," *International Journal of Academic Research in Business and Social Sciences*, vol. 10, no. 3, Mar. 2020, doi: 10.6007/ijarbss/v10-i3/7078.
- [14] S. Sugiyanto, A. Fauzan, L. A. Purwanto, and D. K. Hakim, "Hanoman adventure game based on Android," in *IOP Conference Series: Materials Science and Engineering*, Institute of Physics Publishing, Mar. 2020. doi: 10.1088/1757-899X/771/1/012033.
- [15] P. W. Atmaja and E. P. Mandyartha, "Composing Narrative-Based Gameful Learning Processes: A Skill Atom Approach," in *2020 Sixth International Conference on e-Learning (econf)*, IEEE, Dec. 2020, pp. 126–132. doi: 10.1109/econf51404.2020.9385515.
- [16] R. Andriyat Krisdiawan and A. Permana, "Rancang Bangun Game Treasure of Labyrinth dengan Algoritma Backtracking Berbasis Android," *Jurnal Nuansa Informatika*, vol. 14, no. 1, pp. 46–55, 2020, [Online]. Available: <https://journal.uniku.ac.id/index.php/ilkom>
- [17] M. R. Johnson, "Casual Games Before Casual Games: Historicizing Paper Puzzle Games in an Era of Digital Play," *Games Cult*, vol. 14, no. 2, pp. 119–138, Mar. 2019, doi: 10.1177/1555412018790423.
- [18] R. Ramadan and Y. Widyani, "Game development life cycle guidelines," in *2013 International Conference on Advanced Computer Science and Information Systems, ICACSYS 2013*, IEEE Computer Society, 2013, pp. 95–100. doi: 10.1109/ICACSYS.2013.6761558.
- [19] L. Nadolny, A. Valai, N. J. Cherrez, D. Elrick, A. Lovett, and M. Nowatzke, "Examining the characteristics of game-based learning: A content analysis and design framework," *Comput Educ*, vol. 156, p. 103936, Oct. 2020, doi: 10.1016/j.compedu.2020.103936.
- [20] T. Duplantis, I. Karth, M. Kreminski, A. M. Smith, and M. Mateas, "A Genre-Specific Game Description Language for Game Boy RPGs," *IEEE Conference on Games (CoG)*, pp. 1–8, 2021, doi: 10.1109/CoG52621.2021.9619109.
- [21] B. Suter, "Narrative Patterns in Video Games Narrative Mechanics and Its Rules and Rule Sets."

- [22] P. Sriwatanathamma, V. Sirivesmas, S. Simatrang, and N. H. Bhowmik, "Gamifying Cognitive Behavioral Therapy Techniques on Smartphones for Bangkok's Millennials With Depressive Symptoms: Interdisciplinary Game Development," *JMIR Serious Games*, vol. 11, pp. 1–16, 2023, doi: 10.2196/41638.
- [23] K. Saito, "From Novels to Video Games: Romantic Love and Narrative Form in Japanese Visual Novels and Romance Adventure Games," *Arts*, vol. 10, no. 3, p. 42, Jun. 2021, doi: 10.3390/arts10030042.
- [24] A. Isaksen, D. Wallace, A. Finkelstein, and A. Nealen, "Simulating Strategy and Dexterity for Puzzle Games." [Online]. Available: <http://game.engineering.nyu.edu/projects/strategy-dexterity>
- [25] S. Zhang, "The key of challenging levels: An analysis of 2D puzzle video game levels Faculty of Arts Department of Game Design," Mar. 2023.
- [26] B. Kim and J. Kim, "Optimizing Stage Construction and Level Balancing of Match-3 Puzzle Game with PPO Algorithm Machine Learning," *Electronics (Switzerland)*, vol. 12, no. 19, Oct. 2023, doi: 10.3390/electronics12194098.
- [27] B. Kim and J. Kim, "Efficient Difficulty Level Balancing in Match-3 Puzzle Games: A Comparative Study of Proximal Policy Optimization and Soft Actor-Critic Algorithms," *Electronics (Switzerland)*, vol. 12, no. 21, Nov. 2023, doi: 10.3390/electronics12214456.



*ZONasi: Jurnal Sistem Informasi*

Is licensed under a [Creative Commons Attribution International \(CC BY-SA 4.0\)](https://creativecommons.org/licenses/by-sa/4.0/)