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PHARMACY FRENZY: GET YOUR MEDS RIGHT!

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Article Info

Abstract

Proper medication usage is essential for health and safety; however, traditional learning methods often fail to engage learners effectively. This study addresses this issue by developing Pharmacy Frenzy: Get Your Meds Right! a 2D gamified application designed to enhance users' understanding of correct medication practices through an interactive and engaging experience. The research identifies two primary challenges: the lack of accessible information on proper medication usage and the absence of engaging learning experiences in this domain. The project applies Game-Based Learning (GBL) principles within a PC-based game platform to address these challenges. The game presents players with different scenarios, requiring them to match medications with their corresponding instructions and precautions. Through these interactive challenges, players improve their knowledge of medication, adherence, and safety. The development process follows the Game Development Life Cycle (GDLC), ensuring iterative improvements based on user feedback. The effectiveness of the application was evaluated using the Game Engagement Questionnaire (GEQ), assessing key factors such as absorption, flow, presence, and immersion. The results indicate a high level of user engagement, with a 74% engagement rate among participants, alongside positive learning outcomes. These findings demonstrate the potential of game-based learning in bridging gaps in medication education. Future enhancements may include multilingual support, augmented reality integration, and real-time user progress tracking to further enrich the learning experience.

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Keywords: Game-Based Learning (GBL), Pharmacy Education, Interactive Learning, Educational Games, Game Engagement, Game Development Life Cycle (GDLC)

INTRODUCTION

Patients frequently seek advice from pharmacists rather than consulting doctors for minor health concerns such as coughs, colds, allergies, pain, fever, acidity, diarrhea, and various skin conditions (Smith, 2023). In many countries, the sale of certain medications without a prescription is legally permitted. These medications, known as Over-the-counter (OTC) drugs, can be dispensed by pharmacists without requiring a prescription from a healthcare provider (Marathe, Kamat, Tripathi, Raut, & Khatri, 2020).

The role of pharmacists has evolved significantly from dispensing medications to actively providing pharmaceutical care interventions and managing drug therapies. This shift has had a profound impact on pharmacy education, leading to a transition from traditional basic sciences to more clinically integrated courses. Consequently, active learning strategies have been adopted to equip pharmacy graduates with enhanced competencies and specialized skills necessary for modern pharmaceutical practice (Aburahma & Mohamed, 2015).

Access to essential medications remains a challenge for many individuals due to the requirement of a prescription from a healthcare professional. This creates barriers to obtaining necessary treatment, particularly for those with limited access to healthcare services or financial constraints.

Game-Based Learning (GBL) is an educational approach that utilizes games to teach specific skills and knowledge. By leveraging the interactive and engaging nature of games, this method enhances learner motivation, improves information retention, and provides an immersive educational experience (Gee, 2003). GBL has been applied in various formats, including digital video games and physical board games, and has been adapted to different educational levels and subject areas (Prensky, 2001).

In response to these challenges, this project implements a game-based learning system for medication management with prescriptions. The system incorporates tools for tracking medication adherence, monitoring side effects, and facilitating discussions about treatment options. Additionally, gamified elements are integrated to optimize the prescription fulfillment process, enhance patient counseling, and improve overall medication management.

LITERATURE REVIEW

The literature review explores several key aspects relevant to this study. It begins by discussing the significance of medications and the challenges associated with medication adherence, highlighting the consequences of non-adherence on patient health, treatment effectiveness, and healthcare systems. The review then examines different gaming platforms, including mobile devices, web-based applications, and personal computers (PCs), analyzing their advantages and limitations to determine the most suitable platform for this project. Additionally, it delves into the concept of Game-Based Learning (GBL), assessing its effectiveness in educational settings and identifying the specific model adopted for this study. A comparative analysis of existing medication-related educational applications, such as the *Pharmlator Game*, *Pharmacy Crack Game*, and *Drugs.com*, is presented to evaluate their features, user engagement, and impact on medication literacy. Furthermore, various software development methodologies, including the Waterfall Model, Agile Model, and Game Development Life Cycle (GDLC) Model, are explored to justify the selection of the most appropriate approach for this project. The literature review concludes by summarizing key insights, establishing a strong foundation for the study, and linking the reviewed concepts to the research objectives to ensure a well-informed approach to game development and medication education.

Medications and the Importance of Adherence

Medicines are substances or combinations of chemical compounds used for the diagnosis, treatment, and prevention of diseases, as well as for symptom management (Hilmas, 2018). The development of new medications has significantly contributed to the ability of healthcare professionals to treat various illnesses and save lives. Medications are derived from multiple sources, with many originating from natural products such as plants, animals, and other living organisms. Even today, numerous drugs are plant-based. Some medications are synthetically produced in laboratories by combining chemical compounds, while others, such as penicillin, are obtained as by-products of living organisms, such as fungi. Additionally, certain medications are developed through biological engineering, where genetic modifications in bacteria result in the production of desired chemical substances (Hilmas, 2018).

In modern society, lifestyle-related diseases have become increasingly prevalent, and medication plays a crucial role in their treatment. The use of medicines can be traced back to prehistoric times, evolving significantly in composition and application over the centuries. Traditionally, medications have been regarded as essential tools in restoring health and well-being by acting as barriers against illnesses (More, 2016). Pharmaceuticals, which include a wide range of chemical substances, are used for diagnosing, curing, treating, and preventing medical conditions. Depending on the type of medication and the condition being treated, drugs can be administered through various routes, including oral consumption, topical application, injection, or other methods.

Pharmacies serve as essential healthcare establishments where registered pharmacists are responsible for dispensing medications based on a valid prescription or electronic order from an authorized prescriber (Kelly, 2017). According to the U.S. Food and Drug Administration (FDA, 2019), pharmacies play a critical role in healthcare by ensuring the safe and effective management of prescription medications for various medical conditions. Unlike over-the-counter drugs, prescription medications require approval from a licensed healthcare provider to ensure that patients receive the correct treatment tailored to their specific health needs. The field of pharmacy is governed not only by legal and regulatory frameworks but also by professional standards, peer reviews, ethical guidelines, and strong leadership (Kelly, 2017).

Challenges and Impact of Medication Non-Adherence

Medication adherence is a critical factor influencing patient outcomes, often more significant than the specific treatment itself (Alicia, 2018). The World Health Organization (WHO) estimates that non-adherence contributes to approximately 50% of treatment failures, 125,000 deaths, and 25% of hospitalizations annually in the United States. For optimal therapeutic effectiveness, an adherence rate of at least 80% is required; however, adherence to chronic medications remains around 50% (Alicia, 2018). While medication adherence is typically emphasized during hospital stays, it becomes the responsibility of patients and outpatient healthcare providers after discharge, making it a significant challenge in transitions of care (Carolina, 2018).

Non-adherence to medication has severe consequences at both individual and healthcare system levels. Poor adherence leads to treatment inefficacy, worsening symptoms, complications, and reduced quality of life (Brown & Bussell, 2011). It also increases healthcare utilization, including higher hospital admissions, emergency room visits, and medical consultations, imposing a financial burden on healthcare systems. Studies have linked non-adherence to increased mortality rates, particularly for chronic illnesses, as failing to follow prescribed regimens can lead to severe health complications and even early death (Cutler et al., 2018). Various factors, such as socioeconomic status, education, mental health, and social support, influence adherence levels. While higher education, employment, and financial stability positively impact adherence, ethnic minority status has been associated with lower adherence rates (Kirkbride et al., 2024). Addressing non-adherence requires a multifaceted approach, including patient education, personalized interventions, and cost-effective strategies, which policymakers must consider when developing healthcare policies.

METHODOLOGY

The Game Development Life Cycle (GDLC) was chosen as the methodology for developing this game application, as it offers a structured framework specifically designed for game creation. Adapted from the Software Development Life Cycle (SDLC), the GDLC enhances the management process in game development, ensuring that educational games remain engaging and interactive while achieving defined learning objectives (Ramadan & Widyani, 2013). This methodology fosters active learning by incorporating elements of decision-making, problem-solving, and strategic thinking, which help develop essential cognitive skills such as critical analysis, memory retention, and reasoning.

While the SDLC is widely used in software development, it poses challenges for game design due to its complexity, prolonged development cycles, and frequent iterations. The GDLC, on the other hand, provides a more flexible and efficient approach to game development, making it a more suitable choice for this project (Ramadan & Widyani, 2013). The GDLC consists of four key stages. The initiation phase focuses on defining the game concept, mechanics, and storyline. The production cycle includes pre-production, where game flow and design are outlined; production, which involves coding, asset creation, and program integration; and testing, where functionality and endurance are assessed. The beta testing phase gathers user feedback and bug reports to refine the game, ensuring that it meets all requirements. Finally, the release phase involves selecting the most effective distribution strategy to reach a broader audience and fulfill project objectives.

By adopting the GDLC methodology, this project successfully developed a high-quality educational game that effectively balances learning and entertainment. The structured development process ensured that the game was both engaging and educational, optimizing user experience while enhancing medication-related knowledge (Ramadan & Widyani, 2013). Figure 1 illustrates the Game Development Life Cycle (GDLC) methodology.

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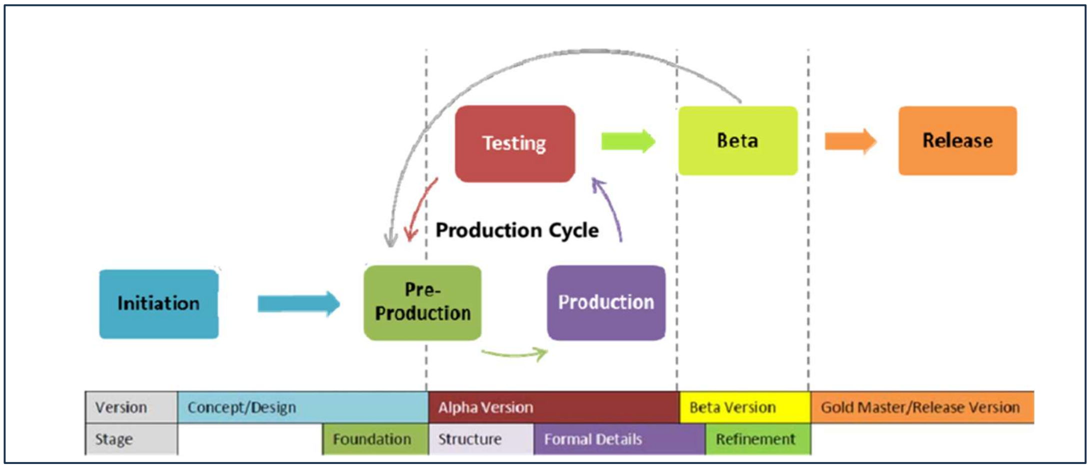

Figure 1: Phase of Game Development Life Cycle
(*source*: Ramadan & Widyani, 2013)

This flowchart, as shown in Figure 2, represents the user journey in the game Pharmacy Frenzy: Get Your Meds Right! detailing the sequence of interactions from the start to the exit. The game begins with an introductory page, where players can choose between three options: starting the game, viewing the instructions, or accessing the learning section. If the player selects "Start," they proceed to a case selection page where they can choose from three different medication-related scenarios. Each case leads to a corresponding gameplay page, where the player must match medicines correctly.

During gameplay, the system evaluates whether the selected medicine matches the correct one. If the answer is incorrect, the player's life count decreases. If the correct medicine is selected within 30 seconds, a congratulatory message appears. Otherwise, if time runs out or all lives are lost, the game over-screen is displayed, giving the player the option to continue or exit.

Alternatively, if the player selects "Instructions," an instruction page is displayed, explaining the gameplay mechanics. If they choose "Learning," they are directed to different learning pages based on their selection. Finally, players can exit the game at any time by clicking the exit button. Figure 1 illustrates this structured decision-making process, ensuring a seamless user experience while effectively integrating learning and gameplay elements.

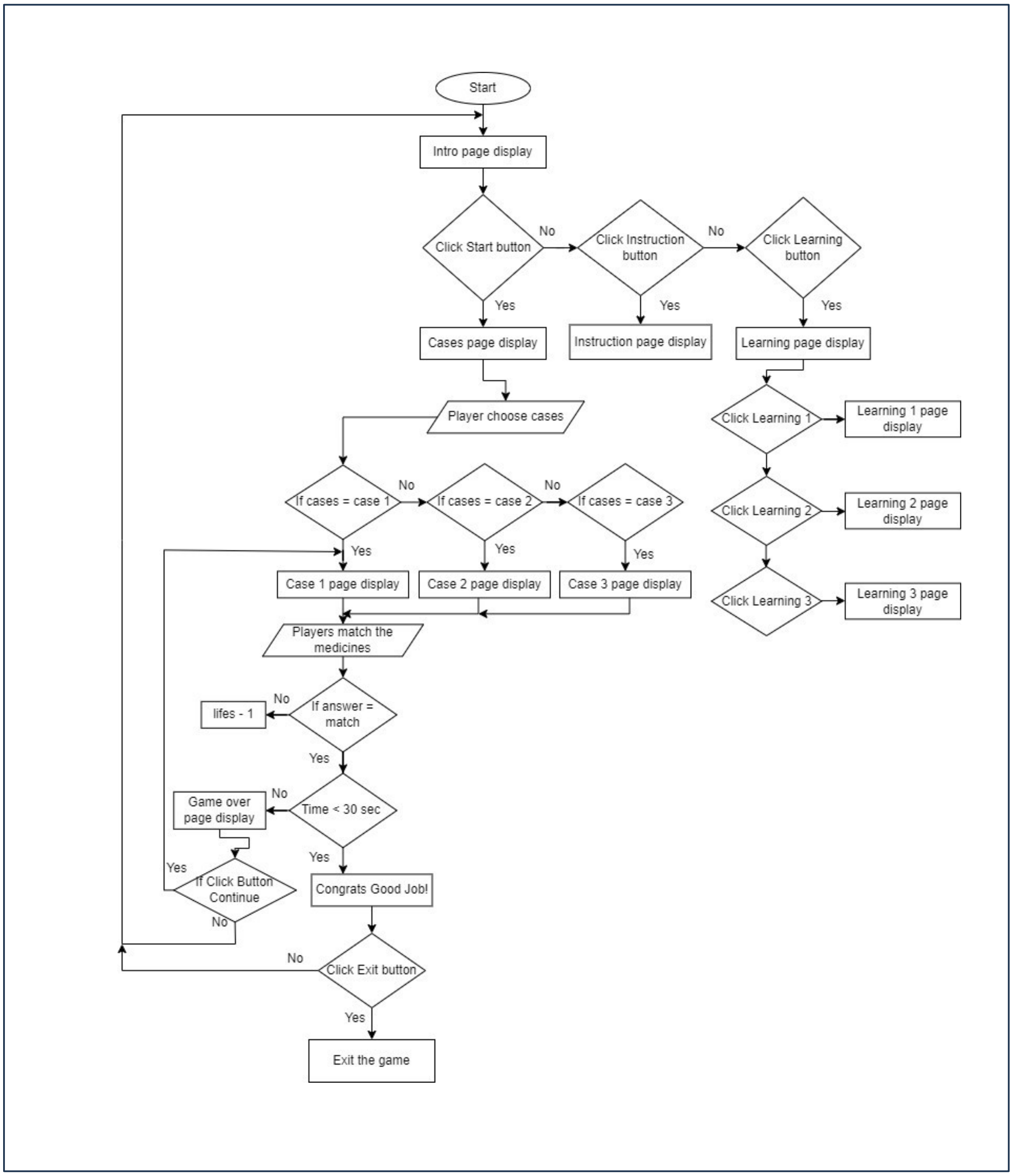

Figure 2: Flowchart

RESULT AND DISCUSSION

Data was gathered from 31 participants via Google Forms using the GEQ Questionnaire, where each item was rated on a scale from "Strongly Disagree" to "Strongly Agree." Each question, corresponding to a specific engagement factor, was computed separately. Table 1 summarizes the average mean and overall engagement percentage across four key elements: Absorption, Flow, Presence, and Immersion. Absorption, measuring how engrossed participants were in the experience, scored a mean of 3.39. Flow, representing a deep focus and seamless interaction, recorded a mean of 3.69, while Presence stood at 3.58. Immersion, reflecting the depth of participants' integration into the experience, achieved the highest mean of 4.19. When combined, these factors yielded an overall mean of 3.7, equating to a 74% engagement level. Although this indicates a generally strong level of engagement, it also reveals opportunities for improvement, particularly in enhancing Absorption and Presence to further strengthen users' concentration and sense of involvement.

Table 1: Total average mean and engagement percentage

Factor	Total Mean
Absorption	3.39
Flow	3.69
Presence	3.58
Immersion	4.19
Average Mean	3.7
Overall Engagement Percentage (%)	**74%**

CONCLUSION

This project successfully integrates educational content with interactive gameplay to enhance the learning of pharmacy-related concepts. By incorporating game-based learning principles, it provides an engaging and immersive experience for users while reinforcing key pharmaceutical knowledge. However, despite achieving its primary objectives, the project has certain limitations that could be addressed in future developments. Constraints such as limited development time, simplified gameplay scenarios, and the absence of advanced technological features—such as augmented reality—restrict the game's potential for a more comprehensive learning experience. Future enhancements could include expanding the complexity of in-game tasks, introducing more challenging scenarios, and integrating emerging technologies to increase engagement and improve knowledge retention. These improvements would not only enrich the learning experience but also ensure a more dynamic and effective educational tool for pharmacy students and professionals.

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