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Research Article

Implementation of Gamification in Health Education System for Pregnant Women

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ABSTRACT

This study evaluates the effectiveness of gamification-based education applications in increasing pregnant women's knowledge about nutrition during pregnancy and reducing anxiety related to pregnancy and childbirth. Using the MDE (Mechanics, Dynamics, and Emotion) framework and design thinking approach, gamification education applications are developed by combining points, levels, badges, and challenges. This app focuses on educating pregnant women about the main aspects of pregnancy and childbirth. Qualitative data was collected through interviews with pregnant women to understand their needs and create player personas to inform gamification designs. The prototype of the application was then tested with pregnant women, and feedback was collected through a google form using a likert scale and analyzed using SPSS. While the normality test showed an abnormal distribution of data, the Kruskal-wallis test did not show any significant difference in understanding between groups of participants after using the prototype, which showed a consistent level of understanding among users.

Keywords: Gamification, Pregnancy Education, Health Education, Mobile Applications, User Experience, Gamified Learning.

INTRODUCTION

Pregnancy, a profoundly transformative and natural physiological process, is inherently accompanied by a spectrum of physical and psychological alterations. These changes, while fundamental to the progression of gestation, frequently precipitate anxiety, particularly among primiparous women experiencing their first pregnancy. This anxiety often originates from deep-seated concerns regarding the health and well-being of the developing fetus, as well as apprehensions about potential unforeseen complications that could arise during the gestational period. If these anxieties are not adequately addressed and managed, they can escalate into a state of chronic stress, which has been demonstrated to exert a detrimental impact on both the maternal psychological well-being and the optimal developmental trajectory of the fetus.

Global epidemiological data, as presented by the World Health Organization (WHO) in its 2020 report, reveals that approximately 8-10% of pregnant women worldwide experience clinically significant levels of anxiety during their pregnancy [1]. Notably, this prevalence rate exhibits a marked increase as women approach the culmination of their pregnancy and the onset of labor, with figures rising to approximately 13% in the immediate prepartum period [2]. Similarly, in Indonesia, data from the Ministry of Health (Kemenkes) in 2020 indicates a substantial prevalence of anxiety among pregnant women, with over 40% reporting experiencing anxiety throughout their pregnancy. This figure further escalates to nearly 50% as women approach the critical juncture of childbirth [3].

The ramifications of unmitigated anxiety during pregnancy extend beyond the immediate gestational period, potentially disrupting the natural physiological processes of labor and delivery. Furthermore, it can contribute to the development of postpartum mental health disorders in mothers, which can subsequently have adverse effects on the

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health and developmental outcomes of their infants. Research consistently underscores the pivotal role of knowledge and education in mitigating anxiety related to childbirth. A lack of comprehensive understanding of the physiological processes involved in labor and delivery can lead to a perception of childbirth as a daunting and frightening experience. Conversely, the provision of accurate, accessible, and timely information and education to expectant mothers has been shown to significantly alleviate their anxiety levels and empower them to approach childbirth with greater confidence and preparedness [4].

Currently, obstetrician-gynecologists (ob-gyns) serve as the primary source of information and guidance for pregnant women through consultations, examinations, and educational interventions. However, the increasing demand for obstetric care, coupled with the limited availability of healthcare providers, has resulted in a significant workload for ob-gyns. With each ob-gyn potentially serving approximately 60 pregnant women daily, the potential for provider fatigue and burnout is a significant concern. This fatigue can potentially compromise the quality of care delivered to pregnant women, impacting the efficacy of information dissemination and the overall patient experience.

To address the challenges posed by the high prevalence of anxiety among pregnant women and the increasing demands on ob-gyns, the adoption of gamification in healthcare education is proposed as a promising solution. Gamification, which involves the integration of game mechanics and design principles into non-game contexts, has been demonstrated to effectively enhance user engagement, motivation, and learning outcomes. By incorporating gamification elements into educational applications specifically designed for pregnant women, it is anticipated that these applications will enhance their knowledge, promote positive behavioral changes, and effectively alleviate their anxiety levels.

This innovative approach aims to support ob-gyns in delivering more effective, engaging, and personalized care to pregnant women, while simultaneously empowering women to actively participate in their own healthcare management by providing access to accurate, timely, and user-friendly information. The proposed gamification system will be developed and implemented using the MDE (Mechanics, Dynamics, and Emotions) Framework, which ensures a user-centric and engaging experience for expectant mothers, ultimately contributing to improved maternal and infant health outcomes [5].

LITERATURE REVIEW

A. Game and Gamification

Games are an interactive activity that is carried out voluntarily. Every game has elements or features that make its players feel attached. There are games that have a lot of elements and there are those that have few elements. Games can be categorized based on genres, such as simulation, education, entertainment, role playing, online multiplayer games, and casual games [6]. With the development of technology and the increasing use of mobile devices, video games motivate millions of people around the world to spend a considerable amount of time playing them. Research was conducted to find out whether the motivation of players who want to complete the game can be implemented in other contexts, that thought is the forerunner of gamification [7]. Whole games are different from gamification, so they must be seen in a different perception. The problem is that it is difficult to distinguish what methods were used in the past or the previous centuries which were part of gamification. Therefore, gamification and the activities it covers need to be clearly defined. To understand and describe the meaning of gamification, it is important to distinguish different characteristics. Figure 1 illustrates the differences between them.

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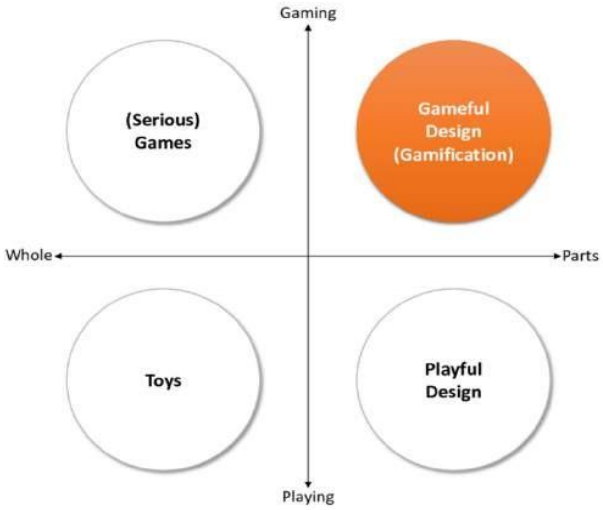

Figure 1: Illustrates the differences between game and gamification

Figure 1 shows the boundary between the game and gamification. (Serious) Games are playing the game in its entirety and applying an aspect of the game. An example of its application is such as training pilots in simulators. Toys emphasize playing more than playing games. To understand more easily, an example of its application is to change the design of the steps to piano keys that will sound when stepped on. The goal is to motivate people to choose to climb the stairs rather than escalators. The three implementations mentioned earlier are not part of gamification.

B. Element of Gamification

Element gamification namely game mechanics and dynamics are the key characteristics and characteristics of gamification. Game mechanics are actors, objects, and hoots that define the rules of a rules-based game system and determine what exists, how things behave and how players can interact with the game world. According to research, the most used game mechanics include Points: points serve as a reward for a player for a certain achievement. The number of points can indicate a player's status, unlock new features or locations that were previously locked in the game, or be used as currency to purchase other in-game rewards. Levels: levels are values or levels that are achieved and become a pillar in the entire game. The level can be used as an indication of how far the player has achieved. Challenges: Challenges are game missions that players must complete. After completing a challenge, players will usually be rewarded with rewards such as trophies, badges, and achievements. Completing a challenge will give you a pleasant feeling. Virtual Goods: virtual goods are objects in the game that can be acquired, sold, bought, and managed by the player. Virtual items serve as game identities that provide space for players to express themselves, compete with other players, and show creativity. Leaderboards: leaderboards are a sequential display of a player's level or achievements in a game. Players can see their own level and the level of others which can cause a sense of competition between players. Gifts and Charity: gifts and charity allows players to voluntarily give donations or rewards in the form of virtual items to other players [8] [9].

When the mechanics offered succeed in stimulating the player, the dynamics of the game come into play. The dynamics of the game aim to motivate players to keep playing. According to, states that the dynamics of the game include Rewards: rewards or rewards given to players in return for their achievements. Prizes can be in the form of points, levels, badges, trophies, or virtual items. Status: status is used as a tool of recognition, fame, prestige, and attention. As a social being, players have the desire to keep moving forward to get a higher status so that they are more appreciated by other players. Achievement: An achievement is the goal of a particular type of player. Achievers' player types love the challenges offered by the game and the achievements gained after completing them. Self-expression: the game provides space for players to express their style and personality in the game. Competition: competition is what spurs game players to make achievements. Alturism: alturism is the human desire to act well and help others. The game provides space for players who want to give gifts or help other players [9].

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Figure 2: Illustrates humen desires to game mechanics

C. Gamification in Health Sector

Gamification It has become a rapidly growing trend in various fields, one of which is health. Gamification In the field of health, it is a powerful tool or method to be used in improving health and welfare. However, we need to be careful in using gamification and need to ensure that gamification It has been well designed and in accordance with the target audience [10]. Here are some of the differences between the uses gamification with non-gamification in the health sector:

Gamification	Non-Gamification
Increase the motivation of patients to participate in health programs (taking medication regularly, exercising regularly, etc.).	Patients' motivation to participate in health programs may be lower, and patients are more likely not to participate in health programs.
Improve patient compliance with physician or nurse instructions.	Patients are less aware of their health compliance, and they are more likely not to follow the instructions of their doctor or nurse.
Increase patient knowledge of various health topics.	Patients become less motivated to learn about various health topics and tend to have misconceptions about their individual health conditions.
It can help patients in changing unhealthy behaviors to become healthier.	It is difficult for patients to change their behavior, and they are more likely to continue behaving as usual.
It can help patients to stay engaged in their health care.	Patients will continue to feel less involved in their health care and will be more likely to feel frustrated or hopeless.

Tabel 1: Comparison of gamification and non-gamification in health sector

Gamification can be an effective tool to increase patient motivation, compliance, knowledge, behavior change, and engagement within the health field. However, it is important to note that research on the effectiveness of gamification in health is still ongoing. Some studies showed positive results, while others showed mixed results. More research is needed to better understand how gamification can be used effectively to improve better health outcomes.

D. MDE Framework

The MDE Framework (Mechanics, Dynamics, Emotions) is a fundamental framework for designing gamification experiences. It breaks down gamification into three key components. This framework is an adaptation of the MDA

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Framework (Mechanics, Dynamics, Aesthetics), which is more commonly used in traditional game design. The primary difference between the two frameworks lies in the emphasis on emotions. While aesthetics is crucial in game design to create immersive experiences, emotions are more relevant to gamification, as it often involves non-game contexts and focuses on driving user behavior and motivation [11]. In planning game, aesthetics it describes a desired emotional response, usually poured out on fantasy, a Guild, a more specific discovery for game on a computer. Aestetics Changed to emotions, because of the term emotions more relevant to customer involvement in a business process. Keys to success gamification i.e. the relationship between Mechanics, Dynamicsand Emotions. It differs from the MDA framework where the relationship is one-way, where the components do not affect each other. This is the basis why researchers choose to use framework MDE (Mechanics Dynamics Emotions) [5].

E. Mechanics

Mechanics is one of the components of the MDA Framework in the form of decisions from designer game or the person who designed gamification to determine the objectives, rules, types of interactions, and limitations of the situation on game which will be played by the player [5]. Mechanics related to the control components and rules implemented in the game such as basic actions, algorithms, machines game and elements game [12]. According to [13] on gamification, mechanicsi is the cornerstone of the gaming experience game which governs how players interact, how to win or lose, when and where to experience the game game it is felt. Mechanics It can be divided into three types, including Setup Mechanics: setup mechanics is a way of thinking about how the environment, settings, objects, and interactions with objects in a game are made. Rule Mechanics: Rule mechanics is a thought of what actions a player is allowed to take and the limits for those actions in creating a pressure on the player. Progress Mechanics: Progress mechanics refer to the various techniques employed by game designers to influence player experience as they advance through the game's narrative.

F. Dynamics

Dynamics at gamification is the type of player behavior that appears when the player takes part in the gaming experience. Contrary to mechanics, which is regulated by game designer, dynamics generated by how the player game can follow mechanics that has been selected or arranged by game designer [5]. Dynamics describe the behaviors, actions, and strategic interactions that arise in play game. Dynamics Explain how it works mechanics in the game based on the player's input and his relationship with mechanics. Usually dynamics related to cooperation, level-up activities, hunting activities, and activities to take opportunities in playing game [11].

G. Emotions

Emotions at gamification is the affective state of mind and reaction evoked among individual players when they participate in the experience gamification [5]. MDE recognizes the importance of emotions in game, this is because positive emotions such as excitement, surprise, victory over a challenge cause pleasure or enjoyment which is the goal of player engagement. Design gamification and potential users have a different focus, where the design will focus on mechanical principles while for users, the principle of emotion is the key [12]. Understand mechanics at game, dynamics and emotions and how these principles relate to each other is the key to success in playing an experience [5].

METHODS

A. Research Design

This study employs the MDE Framework as a foundational approach for gamification design. This framework divides gamification into three key components: Mechanics, Dynamics, and Emotions

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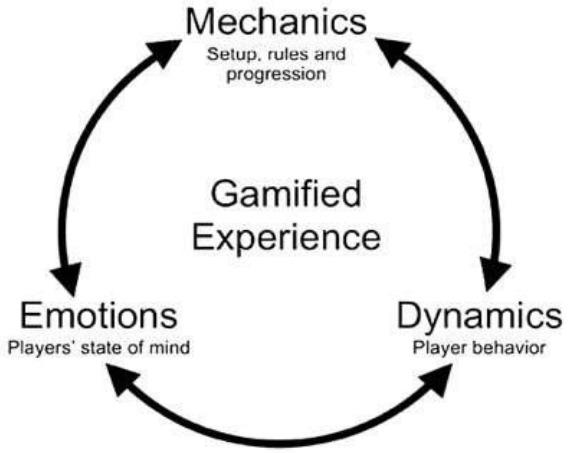

Figure 3: MDE Framework for research design

Mechanics: The rules and structure of the game, including the goals, challenges, and interactions that players experience. These mechanics dictate how players engage, progress, and perceive the overall gaming experience.

Dynamics: The behaviors and actions of players as they interact with the game's mechanics. Unlike the predefined rules, dynamics are emergent and influenced by individual player choices and strategies.

Emotions: The emotional responses and feelings that players experience while engaging with the gamification system. These emotions can range from excitement and satisfaction to frustration and disappointment.

In this study, the method used to develop solutions for gamification-based health education applications is using Design Thinking. Design Thinking is an analytical and creative process consisting of five stages, namely: Empathize, Define, Ideate, Prototype, and Test.

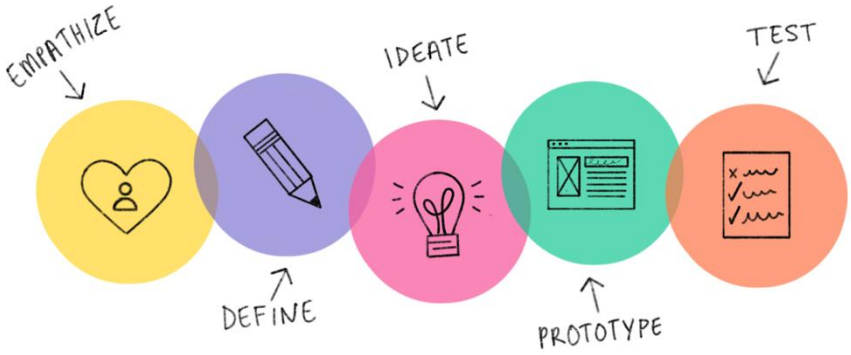

Figure 4: Design Thinking Process

Empathize: In this phase, researchers seek to understand the needs and experiences of potential gamification users. Through user research sessions, they gather insights into the target audience's preferences, behaviors, and pain points. This information is used to create detailed user personas, which serve as representative profiles of the primary target group.

Define: Based on the insights gained from the Empathize phase, researchers identify the specific gamification requirements. By leveraging the Mechanic-Dynamic-Emotion framework, they pinpoint the core elements necessary to create an effective gamification experience.

Ideate: With the user personas and gamification requirements in hand, researchers begin designing the user interface (UI). The focus at this stage is solely on the gamification elements, excluding any additional educational features or modules. Figma is used as a tool to visualize and iterate on the UI design.

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Prototype: The static UI designs are transformed into interactive prototypes using Figma. These prototypes allow for testing and simulation of the gamification experience.

Test: To gather feedback and identify areas for improvement, researchers conduct evaluation sessions. A qualitative approach, such as interviews, is used to collect feedback from both potential users and domain experts like doctors. The insights gained from these evaluations are incorporated into the next iteration of the prototype

B. Data Collection and Processing Methods

In this study, the researchers took a mixed approach, qualitative and quatitative by using the focus group discussion (FGD) method which was divided into three groups in testing the application prototype and a questionnaire with questions about user understanding during the prototype test via Google Form using a Likert scale. Respondent sampling in this study was carried out face-to-face on December 23, 2024 – January 6, 2025. This study processed data from the data obtained in the form of primary data types processed using SPSS for Windows with the following analysis techniques:

a. Normality Test

The normality test is carried out to determine whether the data that has been collected by the researcher is normally distributed or not. The research data that has been collected will be tested for normality until the test results are displayed, if a significant value (P Value) >0.05 is obtained, the data is said to be normally distributed, and if a significant value (P Value) <0.05 is obtained, the data is said to be not normally distributed. This study uses a non-parametric analysis test in processing the data.

b. One-Way Annova Test

The one-way annova test is conducted to determine whether the data collected from the respondents when conducting this prototype test has the same average understanding or not with a test system of more than two groups. The one-way annova test can be conducted if the data collected is normally distributed when the normality test is carried out, then the one way annova test can display the test results with two significant values, if the significant value (P Value) >0.05 then the data collected has the same average understanding, and if the significant value (P Value) <0.05 then the data collected has a different average understanding.

c. Kruskall-Wallis Test

The kruskall-wallis test is conducted to determine whether the data collected from respondents when conducting this prototype test has the same average understanding or not with a test system of more than two groups. The kruskall-wallis test can be performed if the collected data is not normally distributed when the normality test is carried out, then the kruskall-wallis test can display the test results with two significant values, if the significant value (P Value) >0.05 then the collected data concludes that there is no significant difference in understanding between more than two groups, and if the significant value (P Value) <0.05 then the collected data concludes that there is a significant difference in understanding between more than two groups.

RESULTS AND DISCUSSION

To ensure the effectiveness of the gamification system, this study focused exclusively on the needs and experiences of pregnant women. By conducting in-depth interviews with a diverse group of expectant mothers, we aimed to gain a comprehensive understanding of their unique challenges, motivations, and information-seeking behaviors. The data collected from these interviews was meticulously analyzed to create a detailed player persona, a fictional representation of the target user. This persona allowed us to design a gamified learning experience that is both engaging and relevant to the specific needs of pregnant women. The interview questions have various categories, namely General, Demographic, Personality, Pregnancy History, General information seeking skills, and Technology skills. Based on the interview data, we identified two primary player types: Achievers and Killers. To further understand these user groups, we created detailed player personas, visually represented in Figure 5.

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Figure 5: Illustrates of player persona

Killer players are primarily driven by competition and the desire to dominate. Their primary goal is to outscore and defeat other players. In contrast, achiever players are motivated by completion and mastery. They strive to finish the game and conquer every level. By analyzing the information gathered in user personas, researchers can select appropriate game mechanics and design a user interface that aligns with the preferences of the target audience. Once a player persona has been established, researchers can identify the specific gamification requirements by considering the core components of the MDE Framework: Mechanics, Dynamics, and Emotions.

A. Mechanics

Based on our analysis of the player persona and supported by previous research findings, we determined that the primary motivations of pregnant women who will use this application align with the profiles of Achievers and Killers. To enhance their user experience, we have selected the following gamification mechanisms:

1) Points

The use of points is very important in gamification, these points serve as a reward for an admirable achievement or action from the user. Players will level up if they successfully complete the quiz. As the quiz gets more difficult, the number of points earned in each level will increase.

Point Received	Description
+20 Point	Point is earned when completing quiz level 1
+40 Point	Point is earned when completing quiz level 2
+60 Point	Point is earned when completing quiz level 3
+80 Point	Point is earned when completing quiz level 4
+100 Point	Point is earned when completing quiz level 5
+120 Point	Point is earned when completing quiz level 6

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+140 Point	Point is earned when completing quiz level 7
+160 Point	Point is earned when completing quiz level 8
+180 Point	Point is earned when completing quiz level 9
+200 Point	Point is earned when completing quiz level 10
+50 Point	Additional points are earned when answering the quiz before the completion time is up
-20 Point	Answering incorrectly on quiz questions level 1 – level 10
+30 Point	Earned by finishing weekly challenge

Tabel 2: Points illustration for gamification on health education system

2) Level

Levels in gamification sessions serve as milestones. The levels in the game can be used by the user to see how far they have progressed. Users have the option to complete all 10 levels. Depending on how challenging a level is, each has a varying point weight.

Level	Quiz Type	Difficulty
1	Multiple Choice	Easy
2	Multiple Choice	Moderate
3	Multiple Choice	Hard
4	Multiple Choice	Easy
5	Multiple Choice	Moderate
6	Multiple Choice	Hard
7	Multiple Choice	Easy
8	Multiple Choice	Moderate
9	Multiple Choice	Hard
10	Multiple Choice	Hard

Tabel 3: Points illustration for gamification on health education system

3) Badges

Users who successfully accumulate points can be divided into four badge tiers. The awarding of badges into four levels is based on the four stages of the pregnancy process that must be passed: Trimester 1, Trimester 2, Trimester 3, and Childbirth.

Badge	Points	Badge Type	Description
	0 – 500 Points	Bronze	First Trimester
	501 – 1.000 Points	Silver	Second Trimester

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	1.001 – 1.500 Points	Gold	Third Trimester
	1.501 – 2.000 Points	Platinum	Ready to Birth

Tabel 4: Badge illustration for gamification on health education system

4) Challenge

Users must comply with challenges to advance to the next stage or level. This gamification concept presents challenges in the form of multiple-choice questions and weekly challenges that users must complete. To be successful, users must complete the callange within a predetermined time. In this gamification process, the researcher uses a watt meter to assist the researcher in suppressing and limiting the user of gamification. It is hoped that with this active timer it will prevent players from cheating in dictating the speed of the game and asking for help from other more experienced people or other users. For all quiz questions, each is given 15 minutes to complete all questions in each level.

Level	Question Type	Time
1	Multiple Choice	15 Minutes
2	Multiple Choice	15 Minutes
3	Multiple Choice	15 Minutes
4	Multiple Choice	15 Minutes
5	Multiple Choice	15 Minutes
6	Multiple Choice	15 Minutes
7	Multiple Choice	15 Minutes
8	Multiple Choice	15 Minutes
9	Multiple Choice	15 Minutes
10	Multiple Choice	15 Minutes

Tabel 5: Challenge illustration for gamification on health education system

5) Gameplay

The following is the gameplay set by the researcher, starting from opening the application, then choosing the learning course to be followed, studying the learning course being followed, after the user has studied the learning course being followed, the user will work on a quiz from the material previously provided. When working on the quiz, two conditions will occur, the first condition is if the user runs out of time while working on the quiz, the results obtained will be displayed immediately, the second condition is if the user does not run out of time while working on the quiz, the system will check the answers, if the overall answer is correct, then points will be obtained and the badge, points, and levels obtained will be displayed. If all the answers are wrong, then points will be deducted, users are given the opportunity to retake the quiz once to get maximum results, if the user wants to retake it, the flow will repeat the quiz, if the user does not want to retake it, it will display the results, badges, points, and levels obtained. The gameplay set by the researcher for this gamification is as follows:

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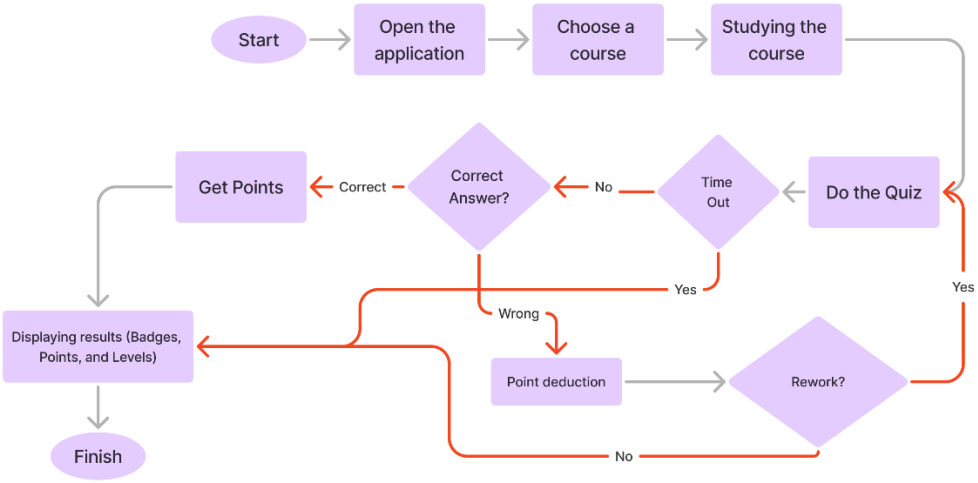

Figure 6: Illustrates of gameplay flow

B. Dynamics

Based on the mapping of emotions in the previous section, the researcher then conducted a mapping related to the dynamics that will be used in this study. Dynamics is a component that includes player behavior, player behavior is created due to player interaction with the mechanics provided by the gamification designer. Based on the matrix framework pioneered by [4] and the relationship between mechanics, dynamics, and user types defined by [Kocadere & Ozhan, 2018]. The dynamics expected to emerge in this gamification design are as described in Table.

Human Desires	Game Mechanics			
	Badge	Levels	Points	Challenges
Reward	✓		✓	
Status		✓		
Competition			✓	
Progression		✓		
Achievement			✓	✓

Tabel 6: Dynamics illustration for gamification on health education system

1) Reward

One of the basic goals of human beings is to get a reward for good deeds. In the gamification session that has been made by this researcher, the researcher gives prizes in the form of points and badges to users as a form of appreciation for the results of the user's efforts in learning about pregnancy.

2) Status

People have a desire to be respected, this is his social trait of human beings that can be fulfilled through position, recognition, and attention. The level component in this gamification is used to motivate players to continue leveling up to obtain a more respectable "Status".

3) Competition

point system is created so that users can compete to prove that they are superior to other users. Users are expected to be the candidates with the most points due to the competitive nature of the system.

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4) User Progression

is given an overview of the journey to be taken and the extent to which progress has been made by showing the number of levels they can access and the levels they currently have. These levels serve to motivate users to keep going until the last challenge in addition to serving as the status they are looking for.

5) Achievement

It is hoped that users will feel more successful and confident in overcoming the next difficulty by successfully completing the various challenges provided by the system.

C. Emotions

This research delves into the diverse spectrum of emotional experiences among pregnant women, with a specific focus on how the pursuit of pregnancy-related information impacts their emotional stability. It was discovered that pregnant women who actively seek pregnancy-related information tend to exhibit lower levels of emotional volatility. To facilitate user engagement, this study adopts an innovative gamified narrative, positioning participants as patients within a simulated healthcare environment. This approach is designed to modulate emotions through an interactive and immersive learning experience, potentially triggering positive emotions such as joy, indicating readiness, or negative emotions such as disappointment, signaling the need for further education. The study systematically maps emotional states at each stage of pregnancy and formulates a series of expected improvements following the application's use. These improvements are detailed in Table 5, which serves as a benchmark for measuring the application's impact on emotional well-being and preparedness of pregnant women. Through this approach, the research aims to provide valuable insights into how gamification technology can be used to support pregnant women on their journey, reduce anxiety, and enhance positive pregnancy outcomes.

Level	Present Condition	Expected conditions after using gamification
1	Users' anxiety and fear of going through pregnancy	Make users confident and assured when going through pregnancy
2	Users' unpreparedness in facing pregnancy	Users become more prepared to face pregnancy
3	Users' emotional uncertainty faced	Users become more able to control emotions
4	Users are confused about what to prepare for pregnancy	Users know what is needed and prepare thoroughly to go through pregnancy
5	Users feeling lack of self-confidence	Users become more confident
6	Users feeling the need for additional nutrition for pregnancy	Users become more aware of the nutrition needs for pregnancy
7	Users feel physically less fit	Users can improve their physical fit
8	Users begin to experience depression during pregnancy	Users can reduce or eliminate their feelings of depression
9	Users feel unsure about being able to give bith	Users are confident in performing childbirth
10	Users feel fear of childbirth	Users become more confident and ready to face childbirth

Tabel 7: Emotions expectation for gamification on health education system

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D. User Interface

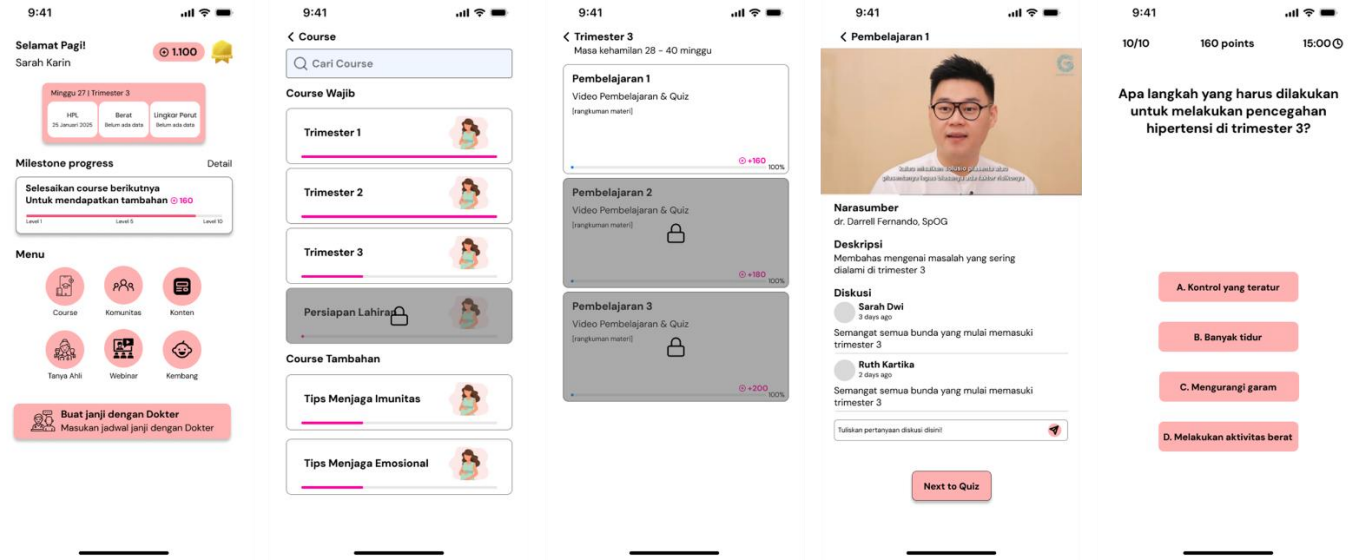

Figure 7: Illustrates of user interface for gamification on health education system

The digital health education application design developed indicates that the system is designed to utilize game elements to enhance user engagement in health learning. Users earn points by answering questions correctly and completing educational tasks. These points can be accumulated and exchanged for virtual or real rewards, such as discounts on health products or other items. The developed system can have levels that users must achieve. As users collect points and complete tasks, they can level up and unlock new content or features. Achievements can also be awarded for specific accomplishments, such as completing a series of quizzes or reading articles on certain topics. Users can be invited to participate in challenges or competitions, such as timed quizzes or challenges to reach specific health targets. This can motivate users to learn and participate actively. The system can provide direct feedback to users about their progress. For example, users can see how many points they have collected, the levels they have reached, and the achievements they have earned. Data visualization, such as graphs or diagrams, can be used to visually show user progress. The gamification system can be personalized according to the needs of each user. For example, users with a higher risk of hypertension will receive more in-depth challenges and information compared to users with a lower risk. In the context of health education about hypertension prevention, gamification can be used to make learning more interesting and interactive. For example, users can be given challenges to measure their blood pressure regularly or follow a healthy diet. Points and rewards can be given for achieving these targets.

E. Result from Prototype Test

The normality test is carried out to determine whether the data that has been collected is normally distributed or not. The research data that has been tested with the Shapiro-Wilk analysis test, from the analysis test obtained a Sig. (P Value) < 0.05 for data that is not normally distributed and a Sig. (P Value) value > 0.05 for data that is normally distributed.

	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Question 1	Group 1	0.594	10	0.000
	Group 2	0.640	10	0.000
	Group 3	0.509	10	0.000
Question 2	Group 1	0.640	10	0.000

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	Group 2	0.594	10	0.000
	Group 3	0.594	10	0.000
Question 3	Group 1	0.655	10	0.000
	Group 2	0.594	10	0.000
	Group	0.640	10	0.000
Question 4	Group 1	0.594	10	0.000
	Group 2	0.655	10	0.000
	Group 3	0.594	10	0.000

Tabel 8: Result of Normality Test

Based on the normality test that has been carried out by the researcher, the results are as shown in Table 7. Where it can be concluded that the Sig. (P Value) value < 0.05 which means that the data can be said to be not distributed normally, this happens because the amount of data collected by the researcher is not more than 30 respondent data, so the data is stated not to be distributed normally.

After knowing that the collected data is not distributed normally, the next test will be carried out using the Kruskall-Wallis test which is a non-parametric statistical test used to test whether there is a significant difference between the group of independent variables and their dependent variables. The Kruskall-Wallis test was also used to look at the comparison of more than 2 population groups. From the Kruskall-Wallis test, an Asymp value is obtained. Sig. (P Value) < 0.05, there is a significant difference, if the Asymp value. Sig. (P Value) > 0.05, then there was no significant difference between the comparison of more than 2 population groups.

	Question 1	Question 2	Question 3	Question 4
Kruskall-Wallis H	3.608	3.366	1.813	1.110
df	2	2	2	2
Asymp. Sig.	0.165	0.186	0.404	0.574

Tabel 9: Result of Kruskall-Wallis Test

From the Kruskal-Wallis test results above, it can be concluded that the Asymp. Sig. (P Value) is > 0.05 for each dependent variable (the questions asked). Therefore, it can be said that there is no significant difference in understanding between group 1, group 2, and group 3. In other words, after the prototype testing, the respondent groups have the same understanding when the prototype testing is conducted.

CONCLUSION AND RECOMMENDATIONS

This research aims to explore the potential of gamification as an innovative method to enhance the quality of education surrounding pregnancy, while also reducing the anxiety often associated with the pregnancy and childbirth preparation period. In this context, gamification refers to the use of game design elements, such as points, badges, levels, and challenges, in non-game contexts to increase user engagement and motivation. To achieve the research objectives, the researchers adopted the MDE (Mechanics, Dynamics, and Emotions) framework and the design thinking approach. The MDE framework enables the development of more structured and efficient applications, while the design thinking approach emphasizes understanding user needs and developing user-centered solutions.

As a result of applying the MDE framework and the design thinking approach, a gamification application specifically designed for pregnancy education was successfully developed. This application was then tested to evaluate its effectiveness in improving understanding of pregnancy and reducing anxiety related to pregnancy and childbirth. The results of the application prototype testing showed that although there were no statistically significant differences between the user group using the gamification application and the control group that did not use the application, there was a consistent level of understanding among users after interacting with the application. This indicates that

gamification has the potential to be a valuable tool for delivering pregnancy-related information in an engaging, interactive, and easily accessible format for various groups.

Nevertheless, this research acknowledges its limitations, particularly regarding the relatively small sample size and non-normal data distribution. These limitations restrict the generalization of the research findings. Therefore, further research with a larger and more diverse sample, as well as more rigorous quantitative analysis, is highly recommended to fully evaluate the effectiveness of gamification-based pregnancy education on knowledge acquisition, anxiety reduction, and ultimately, maternal health outcomes. Despite these limitations, the positive user feedback and consistent level of understanding observed in this study provide a strong foundation for further research into the potential of gamification in the context of pregnancy education. This research paves the way for the development of more effective gamification-based interventions to empower pregnant women with accurate and relevant knowledge, as well as reduce their anxiety surrounding pregnancy and childbirth, ultimately contributing to the improvement of maternal and fetal health.

Of course, no research is perfect, therefore, as a researcher, I would like to provide suggestions that may be used later for further research related to gamification in the medical education topic, including, Research using a larger and more diverse sample to ensure data findings are generalized more broadly to the entire population of pregnant women. Including variations in age, socioeconomic background, education level, and so on. Development of additional features that can explore the addition of new features to gamification-based educational applications. These two suggestions that the researcher can provide can be considered if you want to do further development or conduct further gamification research.

In designing research, of course, it is impossible to cover all the ideas or features that might be implemented to help patients get accurate and complete education. During this research, the researcher has several recommendations that may be used or implemented in subsequent research related to gamification in medical education, including: The use of AI (Artificial Intelligence) to help personalize the education needed by users or pregnant women, so that users or pregnant women get targeted education according to their needs. The use of Chatbots utilizing Big Data to help provide temporary auto-responses related to the needs required by users before consulting with a doctor. These two recommendations may be used or implemented in subsequent research to develop these features in further research.

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Data availability: Dataset for this study is openly available from Mendeley Data at DOI: 10.17632/p8xfmhs54v.1

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