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Designing A Cooking Procedure Simulation Game During the Pandemic In The Food and Beverage Industry Using The Design Play Experience Method

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Abstract: Covid-19 has become one of the world's problems after its first appearance at the end of 2019. At its peak, the COVID-19 pandemic affected many industrial sectors, including the food and beverage industry and, in this case, Indonesia. The main focus in running the industry is health protocols for handling both the cooking and serving processes, which must pay more attention to cleanliness and health to reduce the spread of the COVID-19 virus. Standard operating procedures can be simulated in the game as a lesson in cooking procedures for professionals and the general public. Learning and experience in playing games is a challenge in developing simulation games, so the DPE (Design, Play, and Experience) framework is the choice for the game design method in this research. The study results were evaluated by 15 respondents who tried this game with a distribution of 6 workers in the food and beverage industry and 9 people who were not workers in the food and beverage industry. Game development with the DPE framework gets results in the learning aspect of the experience component for simulation with an average value of 88.70%. For the experience learning aspect, the knowledge players gain after playing the game is 84.87%, with very appropriate criteria.

Keywords: Simulation Game; DPE Framework; Food and Beverage.

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1. Introduction

Since its first appearance in December 2019 in Wuhan, China, the COVID-19 pandemic continues to be a global issue, including Indonesia. To tackle the COVID-19 pandemic, the Indonesian government has issued regulations to regulate various aspects of public interest during the pandemic, causing many changes in several sectors such as the education sector [1], the food and beverage industry, as well as public transportation and tourism [2]. The regulations on health protocols during the pandemic also mention that the food and beverage industry has been able to operate by following health protocols and implementing restrictions. This has resulted in many changes from the beginning of the pandemic until now in the guidelines and standard operating procedures for cleanliness, hygiene, and safety during cooking, serving, and managing food in the food and beverage industry to prevent the spread of COVID-19 [3]. Updates during the COVID-19 pandemic in the standard operations of the food and beverage industry can be incorporated into a simulation genre game that offers information and learning. Through games, physical presence is not required, thus increasing interactivity with the content within the game [4]. Simulation games can be a powerful tool for developing and acquiring new knowledge and skills for both experienced users in the field and beginners [5]. The main focus in this case is on the new cooking and serving procedures during the pandemic, simulated in a game to create an engaging learning experience for users, especially for workers in the food and beverage industry. Designing a game with a simulation genre has been used for learning in specific activities. One such development of simulation game design is the procedure for using personal protective equipment (PPE) to educate nursing students in dealing with health crises [6]. There is other research on serious games that have been well-received by professionals and parents for the care of children with obesity [7]. Another study in the design of simulation games within the scope of serious games is used for nature tourism interpretation using the Design, Play Experience (DPE) framework, emphasizing the play and experience aspects. However, the design phase of the learning aspect affects the user experience as the learning content is presented explicitly in narrative form, thus decreasing the user experience [8]. The lack of experience gained by users can be reconsidered by reviewing each aspect of the DPE framework as a whole [8].

In cooking simulation games to understand local cuisine, the DPE framework resulted in a 74.3% success rate in delivering material and experience [9]. Another method used in serious games is user-centered design (UCD), which can also be combined with the DPE method in the design process [8], successfully motivating children to manage their eating habits and live a healthy lifestyle to prevent diabetes in children [10]. Research has been conducted on the effectiveness of learning through severe games with users categorized into several groups, resulting in statistics on the success of facilitating learning [11]. The DPE framework consists of components covered in several layers and three aspects: design, play, and experience. Layers included in the DPE framework that focus on the game design process include the learning, storytelling, gameplay, user experience, and technology layers. The three aspects and five layers in DPE are interrelated vertically and horizontally, connected by each component. Each aspect of the DPE method influences the others, so the focus should be on the entire method [12]. Based on the results of previous research, the DPE framework can be utilized as a method in educational game design with a simulation genre. Supported by the focus on learning aspects and user experience aspects within the components of the DPE framework [12], it can be used for simulation game design. Considering the issues during the pandemic, particularly in the food and beverage industry, this research aims to develop a simulation game design for cooking procedures using the DPE method. This study is expected to create a simulation game that effectively conveys the new operational standards in the food and beverage industry during the pandemic.

2. Research Method

This research is structured around five key stages: data collection, game design, game development, testing, and documentation. A comprehensive approach was adopted in the initial data collection phase, utilizing both questionnaires and interviews. These methods aimed to gather insights into the latest operational standards prevalent in cafes and restaurants. Additionally, extensive literature reviews were conducted to augment the primary data acquired from the questionnaires and interviews. Moving on to the game design stage, the study adopted the Design, Play, and Experience (DPE) framework. This framework delineates three crucial interaction aspects between the designer and the player, spanning across five layers as illustrated in Figure 1.

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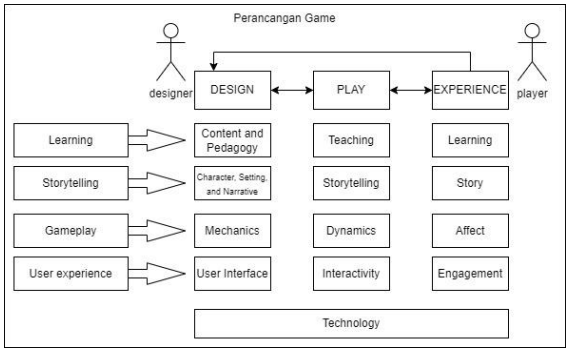

Figure 1. DPE Framework
Source: Winn (2009)[12]

Design, Play, and Experience (DPE) is a framework that emphasizes learning, storytelling, gameplay, and user experience, where each aspect goes through the same layers of design, play, and experience [12]. The aspects and layers in this framework depict the interaction between game designers and players, resulting in the experience of the game. Thus, DPE is oriented towards the development of serious games [13], aligning with the expansion of the MDA method (mechanic, dynamic, aesthetic) [12]. In the game development stage, the finalized design is translated into actual game software, marking the conclusive implementation phase of the project. Subsequently, the game undergoes rigorous testing to pinpoint and rectify any errors or glitches [15]. This phase ensures that users fully immerse themselves in the game, simulating real-world activities as seamlessly as possible. Finally, documentation of the entire research process is compiled into a comprehensive report. This report encompasses all stages of the research journey, from data collection to game development and testing, culminating in presenting results and conclusions. It adheres to standard writing practices, providing a detailed account of the project's methodologies and outcomes.

3. Result and Discussion

3.1 Results

3.1.1 Data Acquisition

Data acquisition for the game design process involved a multifaceted approach, utilizing interviews and questionnaires to gather comprehensive insights. The interviews with two individuals employed in the food and beverage industry provided invaluable firsthand accounts. The interviewees included a restaurant worker and a café owner, offering diverse perspectives on the industry's dynamics, particularly in light of the COVID-19 pandemic. Insights gleaned from these discussions revealed significant shifts in Standard Operating Procedures (SOP) due to the pandemic, corroborated by references from the Ministry of Tourism and Creative Economy (Kemenparekraf). These references, including guidelines for obtaining the Cleanliness, Health, Safety, and Environment Sustainability (CHSE) certificate, served as foundational elements for the game's flow and rules. In parallel, a questionnaire was administered to gauge game requirements from the viewpoint of prospective players—individuals working in the food and beverage sector. A sample of 32 respondents, carefully selected to reflect diverse demographics regarding age and gender, participated in the survey. Utilizing a 5-level Likert scale, the questionnaire covered three distinct sections: general statements about the game, features desired by players, and aspects related to workplace SOP. The findings from this questionnaire provided crucial insights into shaping the game's features, storyline, and gameplay mechanics.

3.1.2 Game Design and Implementation

The game design and implementation process adhered to the DPE framework approach, encompassing various layers delineating design, play, and experience. Within the learning layer, several components, namely content and pedagogy, teaching, and learning play integral roles. Content and pedagogy, as part of the learning layer, are primarily the designer's responsibility. Initially, determining the game's learning objectives precedes the design of content and pedagogy. To ensure that each player gains meaningful learning experiences, the extent to which the game targets learning outcomes is determined based on Bloom's Taxonomy of Teaching and Learning. Specifically, the taxonomy is segmented into remembering, understanding, applying, analyzing, evaluating, and creating levels. For this game design, the targeted learning outcome level is remembering, which involves the recall or retrieval of previously learned information, according to Krathwohl (2002)[14]. This foundational level aims to equip learners with essential concepts for

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subsequent understanding. The overarching goal of this game design is to convey the importance of adhering to Standard Operating Procedures (SOP) in the cooking process within the food and beverage industry, particularly emphasizing cleanliness protocols amidst the COVID-19 pandemic. Drawing from insights gathered through interviews and questionnaires, the content integrated into the game includes:

1) Checking temperatures for workers
2) Washing hands or using hand sanitizer
3) Chefs must be properly dressed when entering the kitchen, wearing a chef hat, chef jacket, apron, safety pants, and safety shoes.
4) Directly cleaning any dirty items.
5) Serving food on time.

The teaching aspect within the learning layer constitutes the next pivotal component from the play perspective. Here, the interaction between the player and the designer is a dynamic process, where the focus shifts to the delivery of content and pedagogy designed by the developer to facilitate learning for the player. In this game, the teaching process is realized through explicit explanations for each item the player interacts with. Moreover, implicit teaching occurs seamlessly throughout the gameplay, contributing to the learning experience. Learning, another essential facet of the learning layer, represents the culmination of the player's experience within the game. The player's experience is a barometer for the game's success in achieving the predetermined learning objectives, particularly concerning the Standard Operating Procedures (SOP) for cooking in the food and beverage industry amid the COVID-19 pandemic. Moving on to the storytelling layer, which encompasses character, setting, and narrative elements, it forms an integral part of the game's design process. Storytelling, constituting the play aspect, translates into the player's immersive experience. The design process within this layer involves crafting characters, establishing the game's setting, and devising the storyline or plot. These elements aim to immerse players in a captivating narrative during gameplay. The presentation of characters, settings, and storylines during the design phase seamlessly integrates into the gameplay experience, bridging the gap between design concepts and player engagement. In the simulation game depicting cooking procedures in the food and beverage industry during the pandemic, players assume the role of assisting a chef character in adhering to SOP. Before embarking on the game, players must select the attire for the chef character, with limited options available. Completing missions at each level unlocks additional chef clothing options for players. Once in the game, players check the temperature of the chef character they control, as depicted in Figure 2. Figure 2 showcases the playable character, symbolizing the chef under the player's control. The game's setting unfolds within a restaurant environment, featuring a kitchen depicted in Figure 3. Additionally, Figure 4 illustrates the main dining area where customers, portrayed as non-playable characters, interact within the game environment.

Figure 2. Kitchen

Figure 3. Customer Area

During gameplay, chairs will be filled with customers displaying an order. Players must direct the chef to collect food items and perform cooking processes, serving them to the customers. Additionally, dirty items will be present that players must direct the chef to clean. The game ends after all customers have been served and the entire restaurant and its items are clean. In the storytelling layer, the storyline crafted by the designer during gameplay serves as the focal point, aiming to captivate the player's interest. Rather than being presented explicitly through narrative text within the game, the storyline permeates the entire gaming experience, evolving dynamically based on the player's decisions and actions. Central to this layer is the story, experienced firsthand by the player. This layer encompasses perspectives from both the designer and the player. In the cooking procedure game context, players perceive the unfolding narrative influenced by the designer's vision and shaped by their own decisions during gameplay. Transitioning to the gameplay layer, emphasis is placed on the mechanics dictating how the game unfolds. During the design phase, mechanics encompass elements such as the game's genre, objectives, and character interactions. Gameplay dynamics dictate how the game progresses based on player interaction, ultimately impacting the player's goals and

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outcomes. The experience obtained by players in this layer hinges on their involvement, including decision-making and speed in character control, which can ultimately determine the game's success or failure. The User Experience (UX) layer, comprising the user interface (UI) design, significantly influences player engagement. The game, designed as a two-dimensional experience based on feedback from the questionnaire, features a top-down view with characters presented in a third-person perspective. The UI elements, including the Main Menu, Select Level, How to Play, and Select Clothing pages, are meticulously designed to enhance player navigation and interaction, as illustrated in Figures 4 to 7.

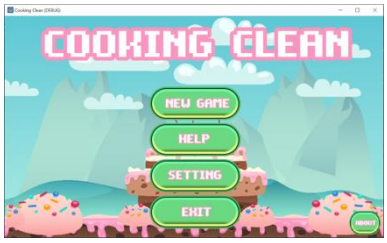

Figure 4. Main Menu Interface

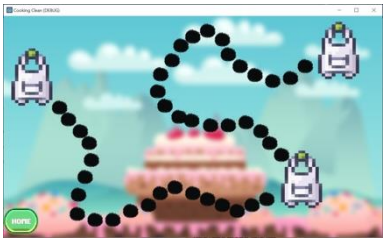
Figure 5. Select Level Interface


Figure 6. How to Play Interface


Figure 7. Select Clothing Interface

The play area encompasses various settings crucial to the gameplay experience. Upon opening the play area page, players are greeted with a layout, as depicted in Figure 8. This layout features essential components such as a virtual joystick for character movement and buttons for performing actions like taking and putting items. Initially, the character is prompted to check the temperature and wash hands on the terrace; upon completion, the door to the next area opens. Figure 9 illustrates the initial play area, while Figure 8 showcases the customer area, where player interactions with non-playable characters occur. Furthermore, Figure 9 depicts the kitchen area where the character prepares food. The top left corner of the kitchen area displays the player's earned points, while the top right corner features a timer indicating the remaining playtime for the level. These distinct play area layouts contribute to the immersive gaming experience, ensuring players remain engaged and challenged throughout the gameplay.

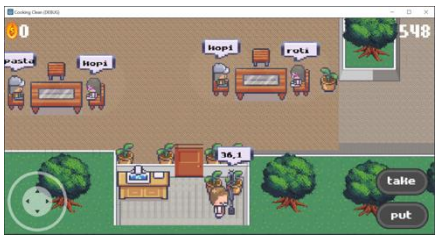

Figure 8. Initial Play Area


Figure 9. Customer Play Area

Interactivity within the game interface, a crucial aspect facilitated by the designer's input, is the primary mode of interaction between players and the game environment. This interactive interface necessitates seamless connectivity between various UI elements, ensuring consistent feedback to the player, thus enhancing the gaming experience. Moreover, engagement, an essential facet of player involvement, is fostered through the user interface design, allowing players to immerse themselves in their character's role. This engagement enables players to embody their character within the game and fosters interactivity through the interface, providing continuous feedback to enhance player experience. Transitioning to the technology layer, the design concepts are actualized using appropriate technological tools tailored to the project's requirements. Utilizing the Godot Engine tool, coupled with the GD Script programming language, the game will be developed as a mobile application compatible with Android devices. Additionally, supplementary technologies such as the

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Android Studio application will support the development process, ensuring seamless integration and functionality within the mobile gaming environment.

3.1.3 Research Evaluation

In the research evaluation phase, data was collected again through questionnaires to measure success. Testing was conducted with 15 respondents with a distribution of gender and age who are workers in the food and beverage industry. Respondents answered five questions based on aspects found in Table 1, which was presented as an initial knowledge test about Standard Operating Procedures (SOP) in the food and beverage industry before playing the built simulation game. The pre-test resulted in an average percentage of 56%. After the respondents played the cooking procedure simulation game, a post-test was conducted to assess the players' memory of cooking procedures in the food and beverage industry during the pandemic. The post-test was conducted with the same respondents and the same questions as the pre-test. The results showed an average of 88%, indicating an increase in correct answers compared to the previous pre-test. The percentage data of correct answer results are shown in Table 1.

Table 1. Pre-Test and Post-Test Results for SOP Knowledge

Aspect Questions	Number of Correct Answers (%)	
	Pre-Test	Post-Test
Pre-work procedures	53,33%	86,67%
Worker clothing procedures	53,33%	100%
Serving procedures	60%	73,33%
Procedures during the pandemic	66,67%	93,33%
Post-work procedures	46,67%	86,67%
Average	56%	88%

After the post-test, the respondents were given a questionnaire containing statements about several aspects found in the game after the respondents played this simulation game to evaluate the success of the method used.

Table 2. Criteria for Categorizing Average Ratings

Average score	Criteria
1.00 - 1.80	Very Inadequate
1.81- 2.60	Inadequate
2.61 – 3.40	Adequate
3.41 – 4.20	Appropriate
4.21 – 5.00	Very Appropriate

The calculation of response results on the questionnaire was done using the Likert scale, with results as shown in Table 3 and categorized based on Table 2.

Table 3. Questionnaire Response Calculation Results

No	Aspect	DPE Component	Average Component (%)	Criteria
1.	User Experience	Design (user interface)	82	Suitable
		Play (Interactivity)	86.60	Very Suitable
		Experience (Engagement)	76.60	Suitable
2.	Gameplay	Design (Mechanics)	75.60	Suitable
		Play (Dynamics)	79.30	Suitable
		Experience (Affect)	73.77	Suitable
3.	Storytelling	Design (Characters)	88	Very Suitable
		Design (Settings)	66	Adequate
		Experience (Story)	76	Suitable
4.	Learning	Design (Content and Pedagogy)	80.87	Suitable
		Play (Teaching)	82.60	Suitable
		Experience (Learning)	84.87	Very Suitable
		Experience (Simulation)	88.70	Very Suitable

Based on the evaluation results, in the learning layer aspect, a percentage of 88.70% was obtained for the experience component obtained by players as a simulation game. The experience gained regarding learning

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resulted in a rate of 84.87%. Other components, such as design and play, were used as part of the learning layer and produced appropriate criteria. Thus, the learning aspect of the game received positive responses from the respondents. Another aspect evaluated is storytelling, which includes character components and the setting of the game area or map. The design of the characters resulted in a suitable score of 88%. Still, the evaluation for the map setting resulted in a score of 66%, which is also the component with the lowest percentage. However, the experience gained by the player for the story aspect still resulted in appropriate criteria with a rate of 76%. The lowest experience value was obtained in the evaluation for the gameplay component. The results obtained for the experience component in this gameplay have an appropriate criterion with a percentage of 73.77%. The experience in this gameplay is the gameplay's effect or influence, including the difficulty of completing missions, the time provided to remember missions, the challenges provided, and the benefits or punishments received by the player. The last aspect concerns user experience, consisting of interface design, interactivity, and player engagement. For the user interface and player engagement with the game, suitable criteria were obtained with 82% and 76.6% percentages. Meanwhile, the play component, which is interactivity, can be concluded that the player finds it easy to interact to control the game with a result of 86.6%. Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Do not use abbreviations in the title unless they are unavoidable.

3.2 Discussion

In evaluating the design and implementation process of cooking procedure simulation games during the pandemic in the food and beverage industry using the DPE Framework (Design, Play, and Experience) approach. This research follows a structured methodological approach, starting from data collection through game development, testing, and documentation. The game's design is based on a DPE approach that emphasizes learning, storytelling, and experience. In the learning layer, components such as content and pedagogy, teaching, and learning play an integral role. Content and pedagogy aim to determine the learning objectives of the game, with learning levels targeted at the remembering stage according to Bloom's Taxonomy. The main aim of this game is to convey the importance of complying with Standard Operating Procedures (SOP) in the cooking process in the food and beverage industry, especially emphasizing hygiene protocols in the midst of the COVID-19 pandemic. The game content design was based on insights gained from interviews and questionnaires, covering procedures such as temperature checks, hand washing, dressing procedures for chefs, and food service procedures. The teaching aspect is implemented through explicit explanations for each item that the player interacts with in the game. Additionally, implicit teaching occurs seamlessly during the game, enhancing the learning experience. Learning experience, as an important aspect in the learning layer, reflects the final result of the player's experience in the game. Placement of storytelling layers, including characters, setting, and narrative elements, becomes an important part of the game design process. This storytelling is integrated into the overall gaming experience, creating an immersive narrative throughout the game. During the design stage, the player selects clothing for the controlled chef character, who then plays the role of assisting the chef in complying with SOPs. The game takes place in a restaurant environment, with players tasked with preparing food and serving customers. At the gameplay layer, game mechanics determine how the game progresses based on player interactions. The player's experience in this layer is greatly influenced by their interactions, including decision making and speed of controlling the character. The User Experience (UX) layer influences player engagement through user interface (UI) design. The game is designed as a two-dimensional experience with a top view. UI elements, such as Main Menu, Select Level, How to Play, and Select Outfit, are designed in detail to improve player navigation and interaction. In the Technology layer, design concepts are implemented using technology tools appropriate to the project requirements. Godot Engine and GD Script programming language were used to develop the game as a mobile application compatible with Android devices. The research evaluation was carried out through a questionnaire, which showed the game's success in conveying material about cooking procedures in the food and beverage industry during the pandemic. The evaluation results showed a significant increase in players' understanding of the SOP after playing the game. The assessment also includes aspects such as learning experiences, simulation experiences, and in-game interaction experiences, all of which received positive responses from respondents. The use of the DPE approach in designing a game simulating cooking procedures during the pandemic in the food and beverage industry has yielded positive results, with the game successfully conveying the desired message while increasing players' understanding and awareness of the importance of adhering to hygiene SOPs. Additionally, the overall evaluation showed good player acceptance of the game, confirming the game's potential as an effective learning tool.

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4. Related Work

Several related works can be a reference and inspiration in developing a simulation game for cooking procedures during the food and drink pandemic. These works cover various aspects, from developing simulation games to implementing health protocols in the food and beverage industry. Several studies have explored the use of simulation games as a learning tool in various cases. Research by Tyerman *et al*. (2021) describes using simulation to train nursing students in using personal protective equipment (PPE) to increase preparedness for health crises [6]. The results show that simulations can improve students' skills and preparation for real-life situations. Serious games are games designed not only for entertainment but also for educational or training purposes. Afonso *et al*. (2021) discussed the development of serious games for treating children with obesity [7]. They found that health professionals and parents received the game well and were influential in helping children understand the importance of a healthy lifestyle. Play Design Experience (DPE) is a framework used in game development to ensure that users have a satisfying and meaningful experience while playing. De Souza Gaspar *et al*. (2020) discussed game design frameworks, including DPE, and analyzed game-based learning approaches in the Brazilian [4]. They found that using frameworks such as DPE can increase learning effectiveness through games.

As hygiene and health awareness increases during the COVID-19 pandemic, the food and beverage industry has implemented strict health protocols to prevent the spread of the virus. Maemunah (2021) discusses the standardization of personal protective equipment (PPE) use in tackling COVID-19 in the food and beverage industry [3]. This research provides insight into the concrete steps taken by the industry to ensure safety and hygiene during the pandemic. Although still rare, the development of simulation games for the food and beverage industry has great potential in supporting training and learning. The results of the development of a cooking simulation game show that the game is effective in increasing knowledge and understanding of health protocols in the food and beverage industry. The development of a cooking simulation game during the pandemic opens up new opportunities to increase awareness of cleanliness and health in the food and beverage industry. By utilizing the right technology and methodology, these games can be an effective tool in training workers and improving hygiene standards in industry, as well as supporting efforts to prevent the spread of disease.

5. Conclusion

This research has resulted in the design of a cooking procedure simulation game during the pandemic in the food and beverage industry implemented using the DPE Framework approach. The game was tested with 15 respondents who tried to play the game. According to the calculations on the questionnaire, the highest results were obtained in the learning aspect, specifically for the experience component for simulation, with an average value of 88.70%. The game also successfully conveyed the material about cooking procedures during the food and beverage industry pandemic with an average questionnaire result in the learning experience aspect, which is the knowledge obtained by the players after playing the game, 84.87%, with very suitable criteria. This is supported by submitting questions about Standard Operating Procedures in the food and beverage industry to respondents before and after playing the game, concluding that the average correct answer has increased. Thus, it can be concluded that using the DPE framework to build this simulation game design has resulted in good outcomes in delivering learning through the game, followed by an entertaining playing experience for users. While developing this simulation game, there were still shortcomings in designing the area setting, which resulted in a "sufficient" criterion but did not decrease the experience obtained. In this study, the Standard Operating Procedures used as learning references in the game are procedures in the food and beverage industry, specifically in restaurants and cafes. Therefore, for further development of this game, exploration can be done in other areas of the food and beverage industry besides restaurants and cafes, as there may be differences in operational standards in each place.

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