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(RESEARCH ARTICLE)

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Development of fitness game applications for learning healthy lifestyle using unity game engine

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Abstract

A lot of individuals in today's society have a poor understanding of physical fitness and the benefits of adequate nutrition and a healthy diet. As a result, the researchers decided to take an important step in light of the general absence of information on physical fitness and its related benefits. Researchers decided to create a game application that would be a great instrument to impart information and understanding to individuals. The major purpose of this application is to introduce users to a variety of fitness routines, allowing them to experiment with various physical exercises. By doing so, it aims to not only increase people's familiarization with various forms of exercise but also inform them of the numerous benefits of incorporating regular physical activity into their lives. The project is a proactive effort to minimize the knowledge gap while promoting a healthier lifestyle among the users. While conducting the study the researcher considered the problem of first the engagement and how to sustain the user's interest in the application and second the user's understanding of using the application and its functionality third the lack of information that the game developers provided in creating an application and last is how to identify the things that the researcher can do to make the flow of the gameplay improved. the researchers use some of the sub-characteristic of the ISO25010 that are appropriate for evaluating the gaming application. After evaluating the game application, the sub-characteristics of Functional Suitability garnered an overall weighted mean of 3.94 Performance efficiency and Usability both have a 3.81 Security has a 3.56, and Portability 3.82, the researchers used the confusion matrix with the help of the tool of Weka Software using the scheme of weka.classifiers.bayes.NaiveBayes the evaluation on the training set has a summary of Correctly classified instances of 90% and Incorrectly classified instances of 10% it indicates that the application has an accurate algorithm.

Keywords: Fitness; Unity Game; Healthy Lifestyle; Exercises

1. Introduction

Since the epidemic affected the entire world, many changes occurred in people's lives during and after the event. The epidemic has changed how we live, work, and engage with one another the pandemic has touched virtually almost every element of human life. It influenced our daily routines, affected our priorities, and raised the consciousness of us safety and health. As some people adjust to these changes, it is evident that the pandemic's impacts will continue to be felt for years to come, leaving a permanent mark on worldwide society as well as individual lives [1-2].

Individuals who used to go to the gym regularly are one of the population categories most affected by the epidemic. Fitness centers and gyms are usually those first to close down to avoid illness spread, resulting in a decrease in people's routines for physical activity [3]. This caused adjustments in their physical activity and lifestyle patterns, and many

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were forced to get creative and retain their physical well-being. Adaptation to new forms of exercise while preserving one's health became part of responding to the epidemic's changes. During the pandemic, a notable trend occurred in which a growing number of people were drawn to the usage of electronic gadgets [4]. As people employed these technologies in their daily lives, the use of technology became more popular. Electronic technologies have played an essential part in assisting individuals in coping with the challenges caused by the epidemic, whether it is distant employment, online study, virtual social engagement, or entertainment. This shift toward digital inclusion has highlighted the value of technology in providing connectivity, access to information, and normalcy in times of crisis [5].

While adjusting to the new norms in people's lives using virtual methods, the researchers decided to design a game application. In doing so, researchers intend to use technology as a tool to deliver essential knowledge on fitness, physical activity, and other activities that may help individuals adjust to their new lifestyle. The game application that the researchers are creating is meant to be a fun and informative tool to help individuals. The gaming application named "FitnLife" is intended to provide its users with useful information, knowledge, and learnings while playing the app. This is accomplished through an informative and enjoyable method that introduces users to a variety of workout routines and healthful diets. "FitnLife" seeks to empower users with the knowledge and skills needed to make educated decisions about their health and well-being by making learning entertaining and pleasurable. This comprehensive technique for fitness and health education improves the user's entire quality of life.

1.1. Statement of the Problem

- **Problem #1**: Sustaining interest in monotonous fitness game applications proves to be a challenge for many individuals. Some users struggle to maintain their engagement and enthusiasm over time.
- **Problem #2:** Users frequently encounter challenges in terms of comprehending its functionality and effectively utilizing its features, resulting in difficulties and confusion while using the application
- **Problem #3:** The current problem revolves around the lack of learning information and logical content available to users within gaming applications. Frequently, these apps prioritize gameplay and entertainment at the expense of providing informative material that could enrich the user experience and offer valuable insights into the game's mechanics and workings
- **Problem #4:** In a lot of free-to-play games, non-paying players are unable to access certain parts or items, giving an advantage to those who make in-game purchases. This causes a separation between players who pay and those who don't, resulting in a "pay-to-win" scenario where spending money gives substantial benefits, leading to frustration and unfairness among players. This doesn't just hurt the gaming experience for those who don't pay, but also poses a threat to the game's community as a whole by creating a growing gap between players [7].

1.2. Objectives of the Study

1.2.1. General Objectives

The general objective of this study is to design and build a game that goes beyond the standard boundaries of entertainment. This game aims to be an essential source of information, and knowledge, and an exciting route for learning fitness. By doing so the game seeks to provide users with a comprehensive and engaging experience that not only entertains but also enlightens, thus improving the usual normal gaming scene.

1.2.2. Specific Objectives

1. To improve user engagement and maintain interest, researchers developed a game that constantly enhances the design, brings more features, and implements clear instructions, in-depth game tutorials, and important information to create a user-friendly game to attract more users. An experience that improves user understanding and effective use of its features while trying to maintain engagement and keep users engaged at different levels.

- Save Progress
- Random Food Item
- Exercise Mode
- Mini Quiz

2. The researchers create and execute comprehensive user training and guidelines for the Fitness Game Application with an emphasis on making ensure that user can completely fully understand how to play and optimized the benefits of the application. Here are the different guidelines:

- Onboarding Tutorials
- Practical Guide
- Game Pop Ups
- Level Specific Instructions

3. To develop a game that enriches the user experience by providing a game mechanic that not only entertains but also serves as an educational tool. The system will provide knowledge and logical content offering users the opportunity to learn and strategize while playing the game. This approach will enable users to immerse themselves in a well-rounded learning process and develop effective strategies while actively partaking in the game. This integration enhances both the gaming experience and the personal development of players, effectively connecting entertainment and education.

4. The application will remove the practice of placing top-up values on all parts of the game. In order to ensure fairness among users, the developers are granting access to all parts of the game. Moreover, this method seeks to level the playing field by enabling all players to play the entire game without any financial obstacles. The focus is on knowledge, strategy, and dedication rather than money, creating a better experience.

1.3. Scope and Delimitation

1.3.1. Scope

The scope of this research is when the application can only be used on mobile devices, tablets, laptops, and computers. This study only applies to mobile users with sufficient storage and Android OS 4.4 or latest. This app is accessible to both men and women because it shows a person's health and whether or not the activities, someone do in their daily lives are healthy but if those users have a disability disorder and if the user have an illness, is not recommended to use the application. It also turns out that when this game is used, it does not need the internet and can be played offline. The other study that is primary focus is on how to educate users about how to develop healthy lifestyles. The estimated age that the person has curiosity about lifestyle is between 16 – 18 years old [8].

1.3.2. Delimitation

The Delimitation of this research is there is also a chance that some users create a MOD APK for those who want to cheat the game immediately. Additionally, Viruses cannot be stopped from infiltrating and destroying the game application. And each individual has his or her unique mind or brain, the application cannot completely change a person's lifestyle. Being able to keep the user's attention and engage them on a regular basis. Since everyone is busy with their own businesses and personal lives, we cannot force them to play our game every day and every time. If the user doesn't have a free time to play our game, there's nothing we can't do about it. Once the data submitted into the app's database has been damaged or hacked, the application data cannot retrieve or restore it.

2. Methodology

2.1. Conceptual Framework

The figure below shows the input, process, output, and evaluation method. The Input of this framework is about the different programming language, application and requirements to create and play a game. In Process this are the ways how to run the application to identify if the application is succeeded [6]. The Output it represents how the application helps the users to improve their lifestyle.

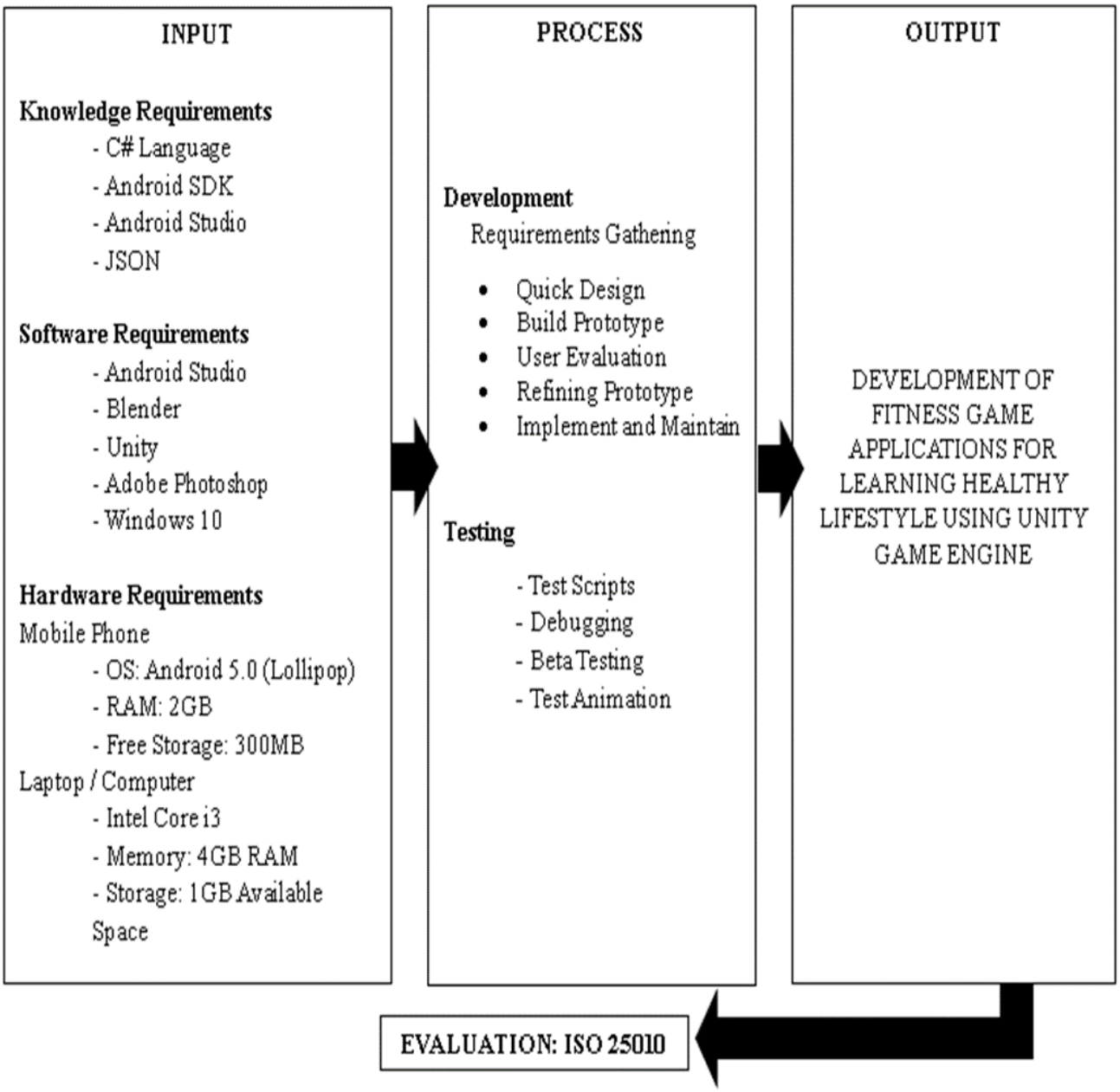

Figure 1 Conceptual Framework

2.2. Story Board

Figure 2 Story Board (Part1)

In this part of Story Board, it will indicate here the process if the user plays the application, it introduces the application and entering a name to create a game file. and it will represent every part of the game.

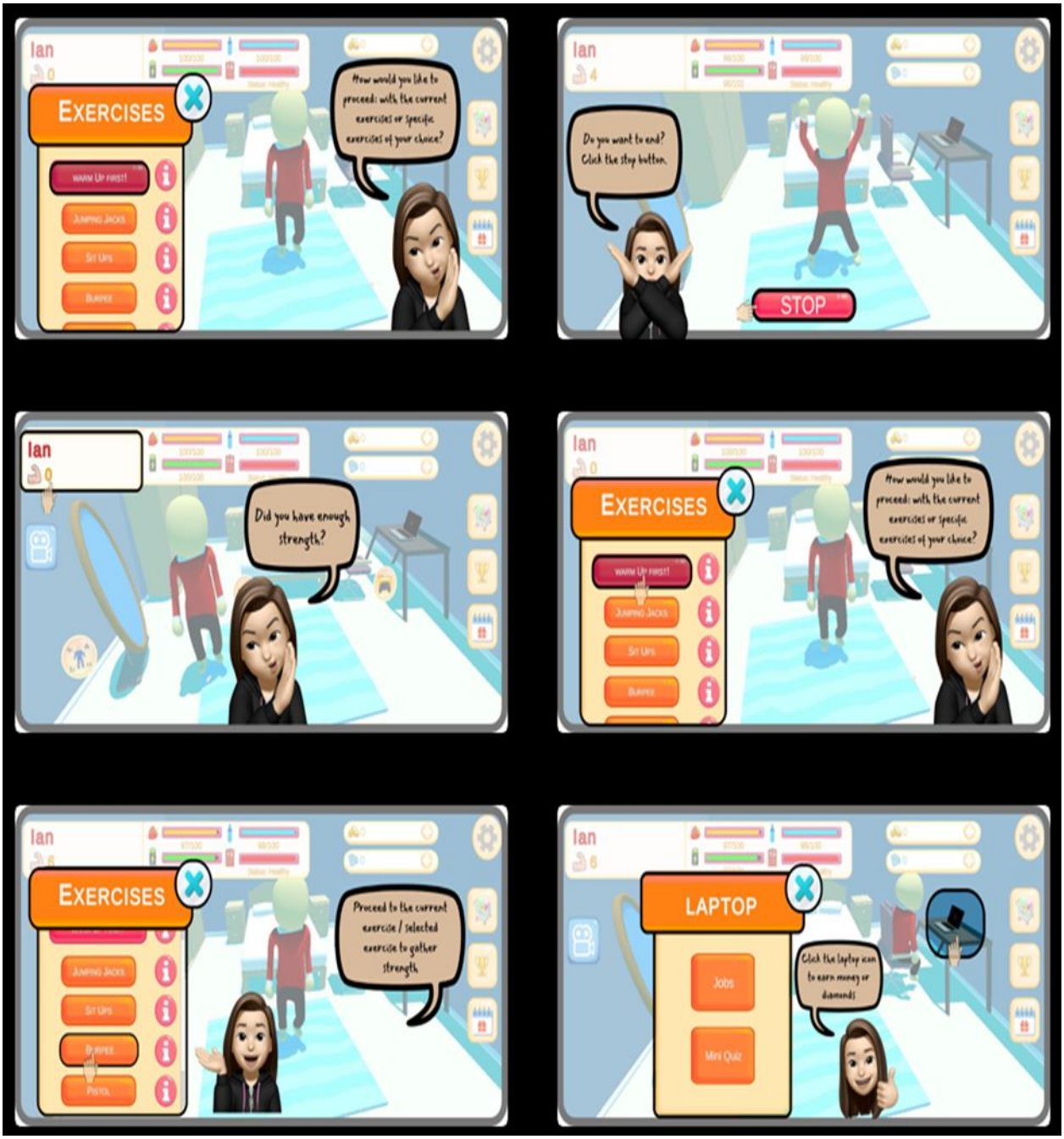

Figure 3 Story Board (Part 2)

In the Story Board part, it will demonstrate how the exercise mode works in the application and shows that the strength of the character is increasing while doing the exercise.

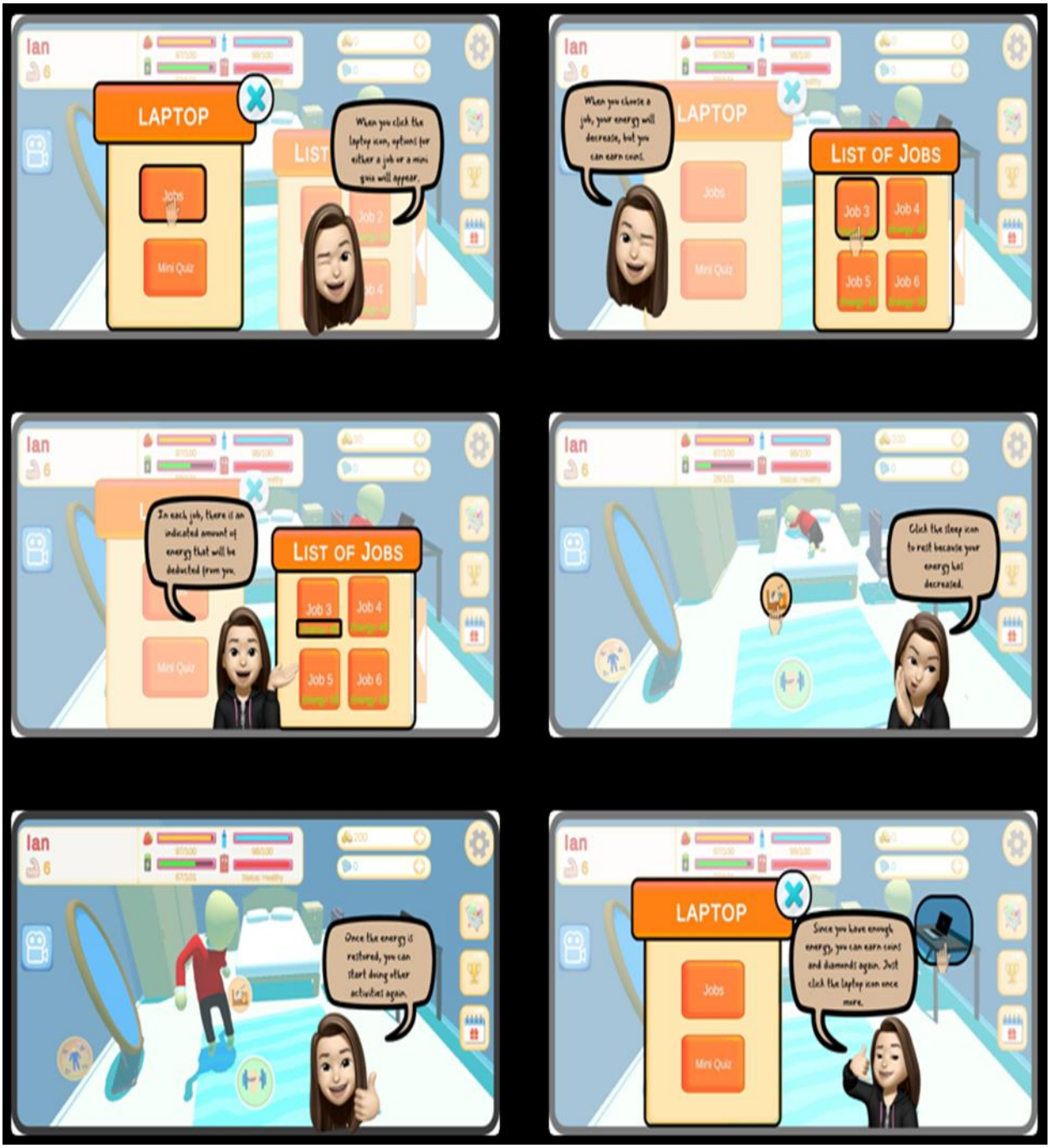

Figure 4 Story Board

In this part, it is about laptop section in which the user can earn coins and diamonds throughout the game. This section has 2 categories, first is the Jobs, where in the user can possibly earn coins while they picking the jobs. This section requires enough energy for each job.

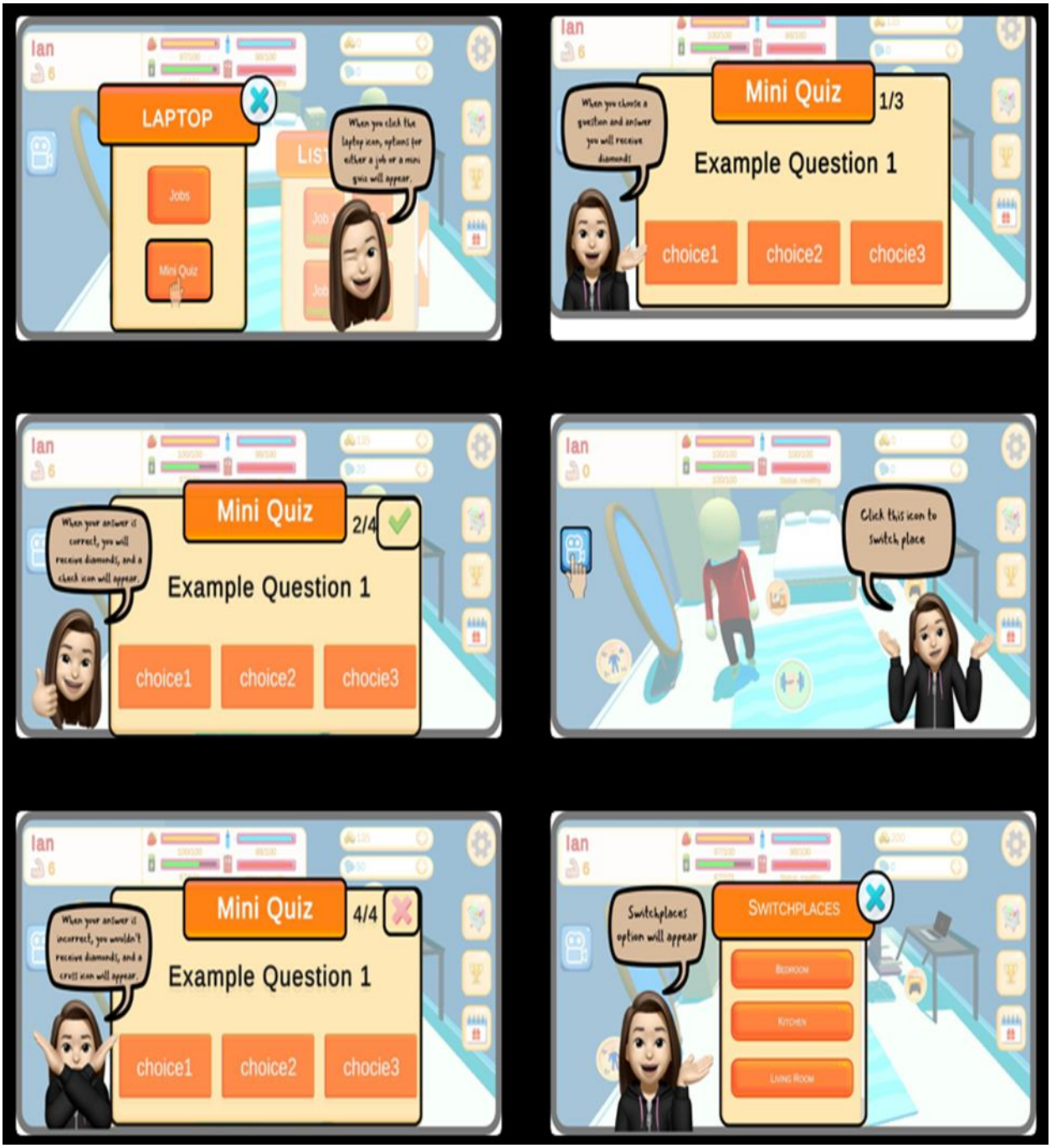

Figure 5 Story Board (Part 3)

In this part, it demonstrates the Mini Quiz Category. The player can click the mini quiz and the question will pop up. Every question has three choices of answer and if the player chooses right answer, they will receive a diamond and if the answer is wrong, they will not receive any diamonds.

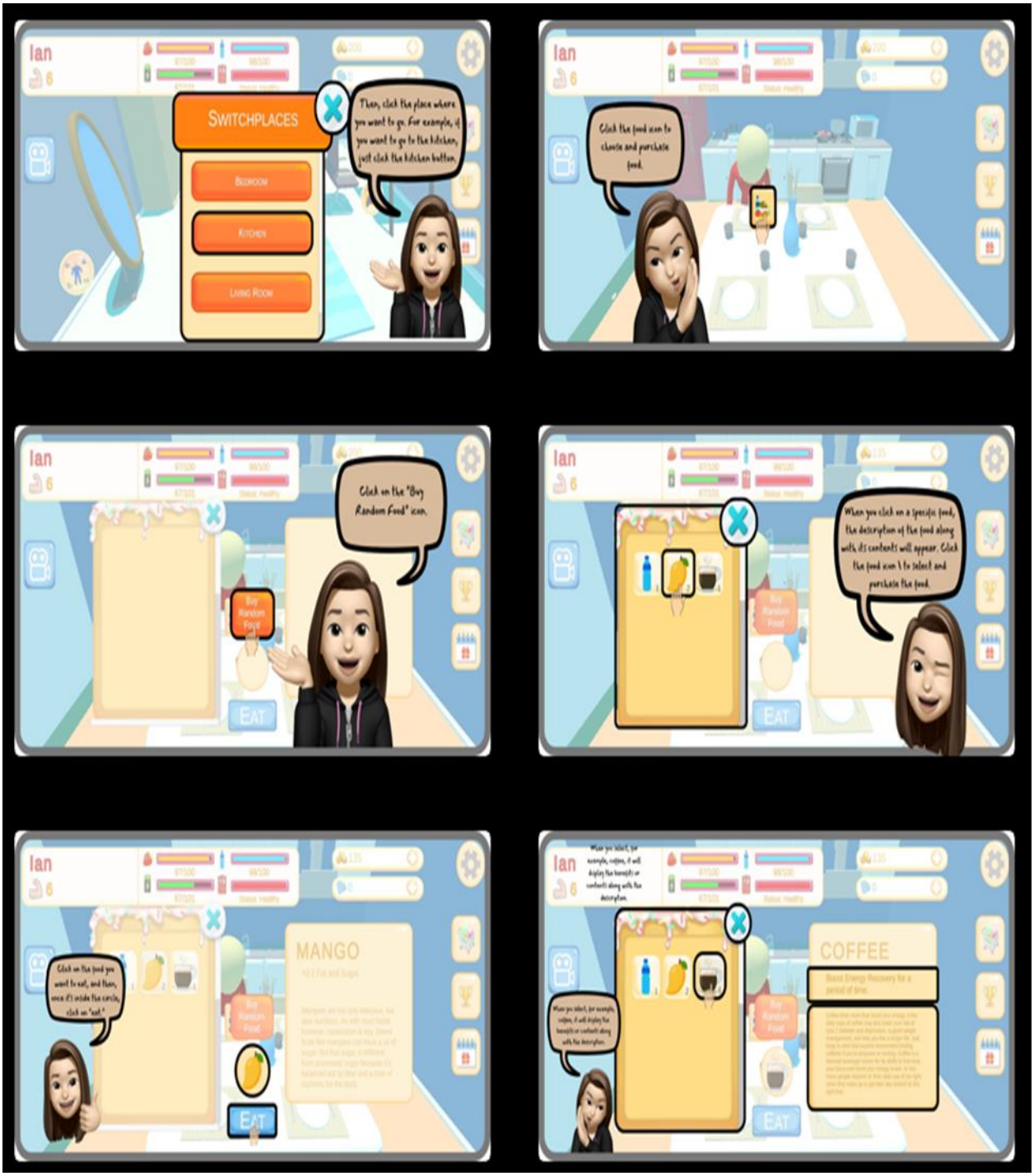

Figure 6 Story Board (Part 4)

In this part of story board, the user can switch places they can go in Kitchen and Living room. First is in the kitchen the user can buy a random food and each foods has a description on how will it help the health of the character

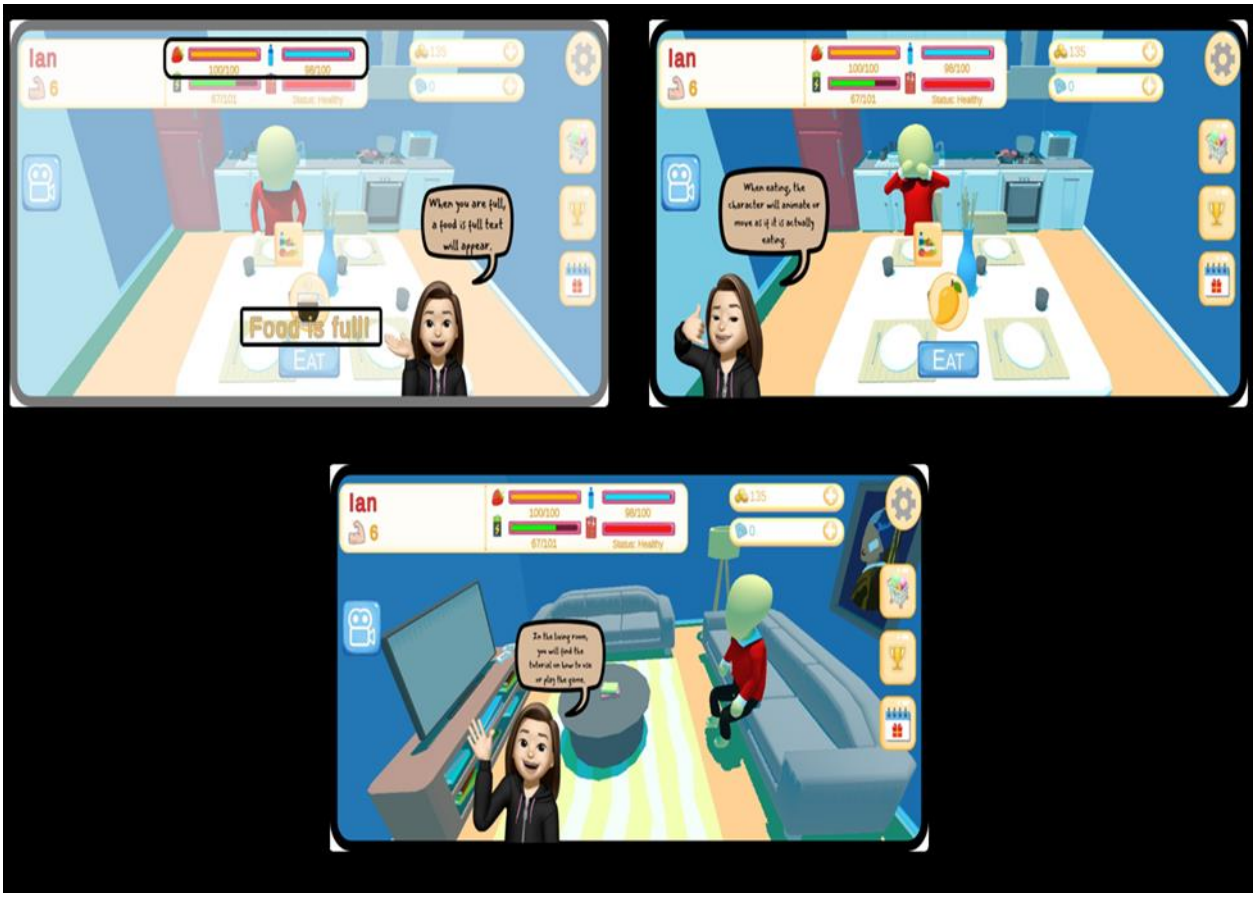

Figure 7 Story Board

Once the character is full, the character is not be able to eat unless they became hunger again. After that once the character is fully recovered, the user can go to the bedroom to exercise or they can go in the living room to watch the tutorial on how the FitnLife Game Application works.

2.3. Prototype Model

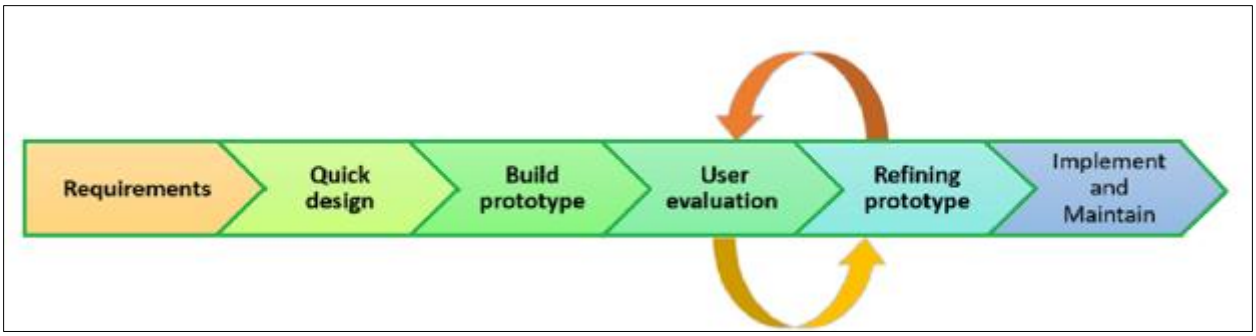

Figure 8 Prototype Model

This methodology is the Prototype Model Method which is demonstrate the different procedure on how to meet the requirements, to do a quick design for references, to build a prototype, to evaluate the application to the users, refining and improving the prototype, and to keep the implement and maintain the smooth conversion of the application [6].

2.4. Instrument Used

The researchers use Descriptive Research as an instrument and tool to gather the proper data and information from a target population regarding the FitnLife Game Application through a survey. This approach aids in obtaining valuable information to further enhance our application. It also allows us to gather potential feedback from users upon using our

application and assess their potential ratings based on the survey conducted. In Survey, the tool that the researcher use is the Google Forms, an online survey tool to gather valuable insights about the performance of the fitness game app created. Researchers sought feedback from users through carefully crafted questions, aiming to understand their experience with the app, assess its usability, and identify areas for improvement.

3. Result

The researchers used ISO 25010 as a complete framework for quantifying and evaluating the gaming application. This evaluation approach included the active participation of 50 respondents who completed a survey that the researchers had designed. The surveyed individuals were a diverse mix, including gamers, students, gym fanatics, and those who genuinely wanted to live an improved way of life. This diverse group of responders ensured a well-rounded viewpoint, allowing for a more thorough assessment of the gaming application's effectiveness and relevance to a diverse demographic. The researchers researched and strategically chose ISO software product quality criteria, specifically Functional Suitability, Usability, Security, Portability, and Performance Efficiency. These criteria provided the researchers with a well-defined framework for completely assessing the application's quality and performance across each of these critical areas.

3.1. Functional Suitability Overall Weighted Mean: 3.94

- Functional Completeness: 4.14
- Functional Correctness: 3.76
- Functional Appropriateness: 3.9

3.2. Usability Overall Weighted Mean: 3.81

- Appropriateness Recognizability: 3.86
- Learnability: 3.7
- Operability: 4.1
- User error protection: 3.58
- User interface aesthetics: 3.8
- Accessibility: 3.82

3.3. Security Overall Weighted Mean: 3.56

- Confidentiality: 3.7
- Integrity: 3.34
- Non-Repudiation: 3.46
- Accountability: 3.72
- Authenticity: 3.56

3.4. Portability Overall Weighted Mean: 3.82

- Adaptability: 4
- Installability: 4.02
- Replaceability: 3.44

3.5. Performance Efficiency Overall Weighted Mean: 3.81

- Time Behavior: 3.82
- Resource Utilization: 3.78
- Capacity: 3.82

3.6. Evaluation

It shows how effective and beautiful when the respondent’s user the game application.

Table 2 ISO 25010

EVALUATION (ISO 25010)							
Functional Suitability	SA 5	A 4	N 3	D 2	SD 1	Sub-Characteristics	Overall Weighted Mean
Q1	20	20	8	1	1	Functional Completeness	3.94
Q2	11	18	19	2	0	Functional Correctness	
Q3	13	22	13	1	1	Functional Appropriateness	
Performance Efficiency	SA 5	A 4	N 3	D 2	SD 1	Sub-Characteristics	Overall Weighted Mean
Q4	16	12	19	3	0	Time Behavior	3.81
Q5	11	20	16	3	0	Resource Utilization	
Q6	14	16	17	3	0	Capacity	
Usability	SA 5	A 4	N 3	D 2	SD 1	Sub-Characteristics	Overall Weighted Mean
Q7	15	16	16	3	0	Appropriateness Recognizability	3.81
Q8	15	11	19	4	1	Learnability	
Q9	20	20	7	1	2	Operability	
Q10	11	12	23	3	1	User error protection	
Q11	11	21	15	3	0	User interface aesthetics	
Q12	13	18	16	3	0	Accessibility	
Security	SA 5	A 4	N 3	D 2	SD 1	Sub-Characteristics	Overall Weighted Mean
Q13	16	11	16	6	1	Confidentiality	3.56
Q14	8	12	22	5	3	Integrity	
Q15	6	15	26	2	1	Non-Repudiation	
Q16	11	15	23	1	0	Accountability	
Q17	7	18	22	2	1	Authenticity	
Portability	SA 5	A 4	N 3	D 2	SD 1	Sub-Characteristics	Overall Weighted Mean
Q18	16	20	12	2	0	Adaptability	3.82
Q19	20	15	12	2	1	Installability	
Q20	10	16	12	10	2	Replaceability	

3.7. Confusion Matrix

3.7.1. Summary

Correctly Classified Instances	18	90	%
Incorrectly Classified Instances	2	10	%
Kappa statistic		0.7368	

Mean absolute error	0.0989
Root mean squared error	0.3127
Relative absolute error	29.402 %
Root relative squared error	77.991 %
Total Number of Instances	20
Ignored Class Unknown Instances	30

3.7.2. Detailed Accuracy by Class

	TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
	1.000	0.125	0.667	1.000	0.800	0.764	0.995	0.950	Agree
	0.875	0.000	1.000	0.875	0.933	0.764	0.533	0.331	Neutral
Weighted Avg.	0.900	0.025	0.933	0.900	0.907	0.764	0.625	0.455	

3.7.3. Confusion Matrix

a	b	<-- classified as
4	0	| a = Agree
2	14	| b = Neutral

4. Discussion

The primary objective of this research is to remind people who use the application that it is important to give their knowledge of how to be healthy the players lifestyle because many people are already content with their current state of health. Those people are uncertain whether the way users live on a daily basis is correct. Some people sit all day because other people don't feel bad about their bodies and hence don't care about their health. So that's what the researchers want to convey in the application: The user should know what are the possible way to take care of yourself by giving them a knowledge about exercising and eating nutritious foods so that you are able to bring your concerns back to your body.

In conclusion, the application created somehow aligned with the intended objectives. In the same manner as the researcher documented in objective 1, designing the FitnLife game is comparable. The researchers enhanced the appearance and design to make it visually appealing to users. Furthermore, regarding objective 2, the researchers implemented modifications to enhance the application's strategic elements and increase its level of difficulty for players. The FitnLife Game Application presents an additional level of difficulty for users when it comes to mastering the gameplay and avoiding monotony. In pursuit of increasing knowledge, the researcher made a decision to enhance Objective 3. Consequently, they incorporated a POP QUIZ feature within the application, obliging the user to participate. In order for the user's learning progress from the game to be easily recognized, it is essential to structure the text as follows: Finally, under Objective 4, the researchers conducted a survey to obtain an accurate assessment of user satisfaction with the FitnLife Game Application. The evaluation method utilized by the researchers was ISO 25010.

In the future, the researchers have the potential to enhance the application by focusing on areas such as improving character animations and increasing the game's difficulty for those seeking more challenging levels researchers can also apply some demonstration when the user plays the application to easily understand what the activity or game needs to do. The second recommendation for future development, which the researchers can consider, is the integration of a feature that can detect a person's body. This feature could display the activities the player needs to perform, providing step-by-step guidance. For instance, if the player is required to do jumping jacks, the detector would visually

demonstrate the correct steps to perform the exercise effectively. If this feature is successfully implemented, the game can introduce competitive matches to make the fitness app even more exciting. For future researchers looking for a reference on how it works, they can find an example in application called "Tuby App". The third interesting suggestion is to explore the possibilities of converting the app become an augmented reality (AR) experience. The game can attain a better level of player engagement and involvement by including augmented reality components. This advancement would not only serve present users but would also provide an intriguing area for future academics and developers to explore, providing a dynamic and engaging fitness app that adapts to an evolving environment of technological developments and user preferences.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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