GEQ and PENS Applications for Analyzing Levels of Player Experience and Satisfaction in Mobile Video Games

Zicko Muhammad Alrizki, Dedy Kurniawan*

109031282025038@student.unsri.ac.id, dedykurniawan@unsri.ac.id
Universitas Sriwijaya

Article Information	Abstract
	Nowadays, video games are getting popular due to the rapid growth of technology, especially mobile technology. Video games are now able to be played on mobile devices whether in single or multiplayer mode by using the internet and it's free and available everywhere. Understanding player experience in mobile video games is essential for developers and researchers. This research evaluates player experience in a mobile video game using the Game Experience Questionnaire (GEQ) and Player Experience Questionnaire (PENS). The evaluation was performed using an online questionnaire form to the participants (N = 110) who had played the specific mobile game. Using the Core Questionnaire from the Game Experience Questionnaire and Player Experience of Need Satisfaction module, this research found that the Game Experience Questionnaire shows high scores values in the aspects of Immersion (4.22), Competence (3.25), and Positive Aspects (4.38) which indicates a good player experience, and the Player Experience of Need Satisfaction shows a rather balanced yet high score for each value that indicates a satisfying player experience.

A. Introduction

Over the last decades, video games have transformed from the ways in which games are traditionally played. Their platforms on which they can be played and their interaction methods have all recently expanded due to new technologies like mobile devices and online gaming [1], [2]. Several studies have stated that mobile video games refer to games played on mobile devices such as smartphones, cellphones, handheld consoles, and PDAs that have wireless communication capabilities and can be played in single-player or multiplayer by using the internet. These games are available everywhere and free, making them popular and well-liked [3], [4], [5].

There are multiple understandings regarding player experience in games. In 2016, Wiemeyer et al. referred to the player experience as the individual gaming experience. It describes the qualities of interaction between player and game during and after the interaction [6], [7]. According to IJsselstein in 2007, player experience is a complex, multi-dimensional construct, perhaps even a multi-paradigmatic construct [7], [8]. In 2008, Lazarro argued that player experience is not the same as user experience; she stated that: "User Experience is the experience of use, while Player Experience is the experience of play." [9], [10]. The term "Player Experience" as stated by Gerling [11] in Wiemeyer [6], "in video games describes the individual perception of the interaction process between player and game." and comes from the instance of user experience explaining a person's view and reaction when interacting with a system, emphasizing the psychological and subjective aspects of what happened while concentrating on the interaction process.

In order to effectively apply game design ideas, create captivating video games, and comprehend the effects of playing video games, an accurate and precise measurement of player experience is important [12]. In 2013, IJsselsteijn theorized that immersion, flow, tension, competence, negative aspect, positive aspect, and challenge are important elements for the gameplay experience [13], [14]. The Game experience questionnaire (GEQ) has been widely applied by game researchers and practitioners to a broad scope of game genres, user groups, gaming environments, and purposes. These can be anything from a single player using a joystick to play a console game via a co-located social game on a multi-touch tabletop for senior citizens to MOBA (Massive Online Battle Arena) games for competitive gamers and immersive virtual learning environments for students [15]. In four separate research, Ryan, Rigby, and Przybylski developed the PENS (Player Experience of Need Satisfaction) by applying the CET (Cognitive Evaluation Theory) motivational model to video games [16]. In 2006, Ryan et al. developed measures of in-game satisfaction for presence, autonomy, relatedness, and intuitive control throughout the game play with the aim in predicting game enjoyment and persistence [17]. In 2019, Högberg et al. explained the dimensions that describe the game experience, including an overview of instruments used to measure the game experience and its dimensions. As for the Game Experience Questionnaire, it assesses the state of the player experience through the dimensions of sensory and imaginative immersion, tension, competence, flow, negative affect, positive affect, and challenge. As for the Player Experience of Need Satisfaction, it determines the state of motivation for play through the dimensions of competence, autonomy, intuitive controls, relatedness, and presence (physical, emotional, and narrative presence) [18].

There are many related studies and researches that use game experience questionnaires (GEQ), for example: Rato et al. used the game experience questionnaire (GEQ) to assess the game assessments for robots in games [19]; Pratama et al. used the game experience questionnaire (GEQ) to evaluate the developed math game [20]; Tao et al. used the game experience questionnaire (GEQ) method to evaluate and adopt HMD-VR health games [21]; Sabet et al. studied the quality of experience by simulating an artificial delay on participants' gameplay. This study employs a subjective approach to examine the impact of these serial-position effects on the game experience questionnaire (GEQ) [22]; Hookham et al. used the game experience questionnaire (GEQ) to measure engagement in serious games [23]; and Pallavicini et al. used the game experience questionnaire (GEQ) to assess and compare player experiences in video games in virtual reality or on desktop displays [24].

In 2020, Palee et al. developed and evaluated a serious game to deliver knowledge about the cleft lip with or without the cleft palate protocol. They developed a game named "Cleft Island" and then evaluated it using different criteria, including the measured knowledge gained by participants and gameplay experience. Among the evaluations conducted, one uses a game experience questionnaire (GEQ) to assess their game experience. The game evaluation results showed the performance of the game in three aspects: knowledge gained, game usability, and game experience [25].

In 2020, Zulfa et al. enhanced the user interface and user experience for the original Bomberman game. They then developed a new game based on the original Bomberman game, named Bomba Game. Bomba game is an enhanced version of the original Bomberman game, where they used the game experience questionnaire (GEQ) method as the basis to evaluate the impact of user interface and user experience on the Bomba game. As a result, Bomba game has more animation, 3D graphics, better audio, more bomb selections, and mobility on the device. The Bomba Game based on GEQ acquired a higher score compared to the original Bomberman game on several aspects, such as challenge, competitiveness, immersion, playfulness, and enjoyment [26].

In 2022, a review of gaming motivations and gaming disorders was conducted with the aim of exploring what gaming motivation questionnaires and classifications are used in studies on gaming disorder symptoms and investigating the relationship between motivational factors and symptoms of gaming disorder [27]. This study mentioned another four studies that use player experience of need satisfaction (PENS), namely: Holding et al. discussed the roles of need satisfaction and passion in the symptoms of behavioural addiction [28]; Kosa et al. in their need frustration in online video games [29]; Mills et al. explore the pull and push underlying problems of video game use using the Self-Determination Theory approach, which is the same theory used for player experience of need satisfaction (PENS) [30]; and Stenseng et al. studied two types of escapism where they used player experience of need satisfaction (PENS) as a method to measure basic need satisfaction in gaming [31].

In 2021, player experience of need satisfaction (PENS) was used to examine the appeal of several Pokémon Go game aspects to players and the relationships between these elements' appeal and players' sensations of presence, enjoyment, and

gameplay duration. The result is that Qin discovered that factors supporting relatedness and autonomy were linked to the player's satisfaction of these needs, and these factors strongly correlated with presence. The length of gameplay was determined by the satisfaction of competence and autonomy demands in relation to game enjoyment [32].

In 2019, an online survey was conducted to collect qualitative and quantitative data from four different online collectible card game players on their experiences of autonomy, competence, and sense of community. The goal was to investigate how player experiences may differ across games in the same game genre and to understand which game design features may be attributed to this difference. In their research, they used player experience of need satisfaction (PENS) survey with 5-point Likert scale items to gain insight into the player experience of competence and autonomy [33].

From the previously described background, this research will focus on analyzing the level of player experience of the players that have played Blue archive mobile video games using two of the most commonly used questionnaires in the player experience field which are the Core Questionnaire of Game Experience Questionnaire (GEQ) [13], [34] and the Player Experience of Need Satisfaction (PENS) [16], [12].

B. Research Method

This research aims to focus on the evaluation of player experience that have played Blue Archive mobile video games. The data used in this research came from the online questionnaire form. The methodology used in this research consists of the usage of the game experience questionnaire (GEQ) core module/questionnaire, which consists of 33 questionnaires that each assess game experience as scores on seven components: immersion, flow, competence, positive aspect, negative aspect, tension, and challenge, and the usage of the player experience of need satisfaction (PENS), which consists of 18 questionnaires that assess autonomy, presence, intuitive control, and presence. Once the data is collected, it will be processed using IBM SPSS Statistics in order to test the validity and reliability of the obtained data. Once the data have been processed, the data will be interpreted in table, and diagrams before drawing conclusions about the research. The depiction of the stages of research can be seen in Figure 1.
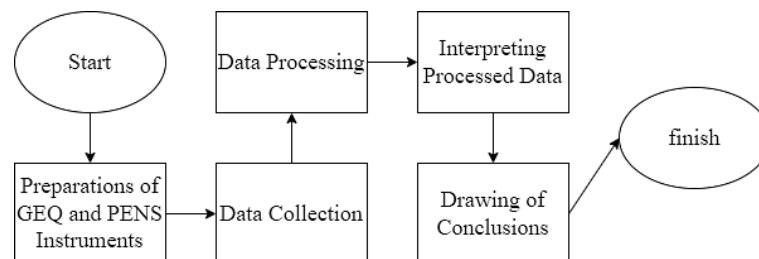

Figure 1. Flowchart Stages of Research

2.1. Game Experience Questionnaire (GEQ)

An instrument for measuring user experiences is the Game Experience Questionnaire (GEQ). Numerous research studies linked to game development have

used the Game Experience Questionnaire as a means of measuring user experiences. [20].

The purpose of the Game Experience Questionnaire is to offer a thorough assessment of the gameplay. The construction of the Game Experience Questionnaire does not depend on any particular hypothesis. Instead, focus groups with a variety of gamers and conceptual descriptions of player experiences act as the basis for the Game Experience Questionnaire. [35].

IJsselsteijn et al. stated that the Game Experience Questionnaire (GEQ) has three modular structures: The Core Questionnaire, which has 33 sets of questions; The Social Presence Module which has 17 sets of questions; and The Post-game Module, which also has 17 sets of questions [13]. This research, however, will use The Core Questionnaire only. The Core Questionnaire assesses game experience as scores on seven components: Immersion, Flow, Competence, Positive and Negative Affect, Tension, and Challenge. The following Table 1 shows the set of questionnaires for The Core Questionnaire:

Table 1. Game Experience Questionnaire (GEQ) Core Questionnaire question set

No	Question	No	Question
1	I felt content	18	I felt imaginative
2	I felt skillful	19	I felt that I could explore things
3	I was interested in the game's story	20	I enjoyed it
4	I thought it was fun	21	I was fast at reaching the game's targets
5	I was fully occupied with the game	22	I felt annoyed
6	I felt happy	23	I felt pressured
7	It gave me a bad mood	24	I felt irritable
8	I thought about other things	25	I lost track of time
9	I found it tiresome	26	I felt challenged
10	I felt competent	27	I found it impressive
11	I thought it was hard	28	I was deeply concentrated in the game
12	It was aesthetically pleasing	29	I felt frustrated
13	I forgot everything around me	30	It felt like a rich experience
14	I felt good	31	I lost connection with the outside world
15	I was good at it	32	I felt time pressure
16	I felt bored	33	I had to put a lot of effort into it
17	I felt successful		

As stated, The Core Questionnaire is one of the modules that measures the Game Experience that players have felt while playing the game, which is poured into several components as seen in Table 2 below:

Table 2. Scoring guidelines for the GEQ Core Questionnaire

No	Components	Questionnaire
1	Immersion	3, 12, 18, 19, 27, and 30
2	Flow	5, 13, 25, 28, and 31
3	Competence	2, 10, 15, 17, and 21
4	Positive Affect	1, 4, 6, 14, and 20
5	Negative Affect	7, 8, 9, and 16
6	Tension	22, 24, and 29
7	Challenge	11, 23, 26, 32, and 33

2.2. Player Experience of Need Satisfaction (PENS)

Ryan et al. stated that PENS is elaborated from the Self-Determination Theory (SDT). This theory addresses factors that either facilitate or undermine motivation, both intrinsic and extrinsic, such as Autonomy, Competence, Presence, and Intuitive Control [16]. However, an addition of Relatedness can be seen and has already been used by Qin [32] and Inchamman [36] in their own respective research. Thus, this research will use all of the factors, which are the Autonomy, Presence, Intuitive Control, and Relatedness.

The set of PENS questionnaires itself can be elaborated on from the Self-Determination Theory. However, for Autonomy, Presence, and Intuitive Control already have examples in [16]. For the Relatedness, the description will be taken from Inchamman [36] research, and for the questionnaire, examples will be taken from both Inchamman [36] and Qin [32] research. Examples and descriptions can be seen in the Table 3 below:

Table 3. PENS components, descriptions and examples

No	Components	Description	Examples Given
1	Autonomy	A scale to assess the degree to which participants felt free, and perceived opportunities to do activities that interest them	"I did things in the game because they interested me.", "I felt controlled and pressured to be a certain way"
2	Presence	This scale was developed to assess a sense of immersion in the gaming environment. There are three items to assess each presence, each of the items can be seen in the next section.	Physical presence (e.g., "When moving through the game world I feel as if I am actually there."); Emotional presence (e.g., "I experience feelings as deeply in the game as I have in real life."); Narrative presence (e.g., "When playing the game, I feel as if I am an important participant in the story.")
3	Intuitive Control	Assesses on how participants experience the interface that controls their character's actions in the virtual environment	"When I wanted to do something in the game it was easy to remember the corresponding control."
4	Relatedness	This scale assesses the desire to connect with others in a way that they feel authentic and supportive.	"I find the relationships I form in this game fulfilling.", "I find the relationships I form in this game important.", "I don't feel close to other players."

C. Result and Discussion

In this stage, research will be carried out in the form of analysis using test data from questionnaires to find out more specifically about the problems in the Blue Archive mobile video games.

3.1. Demographic Results

The following is the table regarding the respondents' demographic:

Table 4. Summary of Respondents' Characteristics

	Amount	Percentage
Gender		
Male	107	97%
Female	3	3%
Age		
13-17	17	15.5%
18-22	73	66.4%
23-27	16	14.5%
28+	4	3.6%
Tenure (Months)		
1-6 Months	44	40.0%
7-12 Months	20	18.2%
12+ Months	46	41.8%

According to Table 4 above, most of the players that play the Blue Archive mobile video games are aged around 18-22 years old (73 respondents), followed by 13-17 years old (17 respondents), then 23-27 years old (16 respondents), and finally those who are 28 years old or older (4 respondents). The majority of the players are male; as can be seen from the data, 97% of the respondents are male (107 respondents), while the rest of the 3% are female (3 respondents). Most of the players have been playing the game for more than a year, with 46 respondents, 44 respondents playing for 1-6 months, and finally, 20 respondents playing for 7-12 months.

3.2. Data Analysis Results

3.2.1. Validity Test

Using 20 respondents for the validity test and a sig. of 5%, the r value found is 0.4438. Each of the variables is valid if the correlation of the r count is larger than the r table. The results of the validity test for each variable question vary, which can be seen in Table 5 below:

Table 5. Validity Test Result

Variable	Code	R Count	R Table	Validity	Variable	Code	R Count	R Table	Validity
Immersion	IMMR1	.837		**VALID**	Tension	TENS1	.659		**VALID**
	IMMR2	.588		**VALID**		TENS2	.881		**VALID**
	IMMR3	.628		**VALID**		TENS3	.829		**VALID**
	IMMR4	.917		**VALID**	Challenge	CHAL1	.617		**VALID**
	IMMR5	.878		**VALID**		CHAL2	.726		**VALID**
	IMMR6	.773	.4438	**VALID**		CHAL3	.616	.4438	**VALID**
Flow	FLOW1	.782		**VALID**		CHAL4	.733		**VALID**
	FLOW2	.863		**VALID**		CHAL5	.562		**VALID**
	FLOW3	.863		**VALID**	Presence	PRES1	.614		**VALID**
	FLOW4	.764		**VALID**		PRES2	.848		**VALID**
	FLOW5	.793		**VALID**		PRES3	.731		**VALID**
	COMP1	.846	.4438	**VALID**		PRES4	.623	.4438	**VALID**

	COMP2	.763	**VALID**		PRES5	.810	**VALID**
Compet-ence	COMP3	.930	**VALID**		PRES6	.759	**VALID**
	COMP4	.697	**VALID**		PRES7	.841	**VALID**
	COMP5	.641	**VALID**		PRES8	.774	**VALID**
	POST1	.722	**VALID**		PRES9	.818	**VALID**
Positive Aspect	POST2	.680	**VALID**	Auto-nomy	AUTO1	.884	**VALID**
	POST3	.818	**VALID**		AUTO2	.862	**VALID**
	POST4	.789	**VALID**		AUTO3	.918	**VALID**
	POST5	.835	**VALID**	Related-ness	RLTD1	.851	**VALID**
	NEGT1	.612	**VALID**		RLTD2	.818	**VALID**
Negative Aspect	NEGT2	.715	**VALID**		RLTD3	-.153	**INVALID**
	NEGT3	.611	**VALID**	Intuitive Control	INTC1	.865	**VALID**
	NEGT4	.793	**VALID**		INTC2	.649	**VALID**
					INTC3	.772	**VALID**

The conclusion that can be drawn is that all of the instruments in the game experience questionnaire (GEQ) (Immersion, Flow, Competence, Positive Aspect, Negative Aspect, Tension, and Challenge) can be used in the research; however, the player experience of need satisfaction (PENS) (Presence, Autonomy, Relatedness, and Intuitive Control) has one variable code that is invalid, which is RLTD3, which has a score value that is less than the r table that has been set. Thus, the variable code has to be deleted, and the validity test has to be repeated in order to gain the entirety of valid data and variables. The result of the second validity test can be seen in Table 6 below:

Table 6. Validity Test Results

Variable	Code	R Count	R Table	Validity	Variable	Code	R Count	R Table	Validity
Immer-sion	IMMR1	.837		**VALID**	Tension	TENS1	.659		**VALID**
	IMMR2	.588		**VALID**		TENS2	.881		**VALID**
	IMMR3	.628		**VALID**		TENS3	.829		**VALID**
	IMMR4	.917		**VALID**	Chal-lenge	CHAL1	.617		**VALID**
	IMMR5	.878		**VALID**		CHAL2	.726		**VALID**
	IMMR6	.773		**VALID**		CHAL3	.616		**VALID**
Flow	FLOW1	.782		**VALID**		CHAL4	.733		**VALID**
	FLOW2	.863		**VALID**		CHAL5	.562		**VALID**
	FLOW3	.863		**VALID**	Pre-sence	PRES1	.614		**VALID**
	FLOW4	.764		**VALID**		PRES2	.848		**VALID**
	FLOW5	.793		**VALID**		PRES3	.731		**VALID**
Compet-ence	COMP1	.846		**VALID**		PRES4	.623		**VALID**
	COMP2	.763	0.4438	**VALID**		PRES5	.810	0.4438	**VALID**
	COMP3	.930		**VALID**		PRES6	.759		**VALID**
	COMP4	.697		**VALID**		PRES7	.841		**VALID**
	COMP5	.641		**VALID**		PRES8	.774		**VALID**
Positive Aspect	POST1	.722		**VALID**		PRES9	.818		**VALID**
	POST2	.680		**VALID**	Auto-nomy	AUTO1	.884		**VALID**
	POST3	.818		**VALID**		AUTO2	.862		**VALID**
	POST4	.789		**VALID**		AUTO3	.918		**VALID**
	POST5	.835		**VALID**	Related-ness	RLTD1	.943		**VALID**
Negative Aspect	NEGT1	.612		**VALID**		RLTD2	.948		**VALID**
	NEGT2	.715		**VALID**	Intuitive Control	INTC1	.865		**VALID**
	NEGT3	.611		**VALID**		INTC2	.649		**VALID**
	NEGT4	.793		**VALID**		INTC3	.772		**VALID**

After the second validity test, after removing the variable code RLTD3, there are a total of 50 valid questions that have an r value larger than the predetermined r table of 0.4438.

3.2.2. Reliability Test

Cronbach's Alpha is the most commonly used reliability coefficient in order to determine the reliability of the data collected through the questionnaire. The questionnaire's alpha value must be equal to or above 0.7 to be determined as reliable. However, if the alpha value is less than 0.7, that means the data is seriously suspect and/or unacceptable. The result of the reliability test can be seen in Table 7 below:

Table 7. Reliability Test Results

Components	Cronbach's Alpha	Alpha	Reliability Status	Task
GEQ	.826	0.70	**RELIABLE**	33
PENS	.849	0.70	**RELIABLE**	17

The results of the reliability test on the game experience questionnaire (GEQ) Core Questionnaire (with 33 tasks, namely 6 Immersion, 5 Flow, 5 Competence, 5 Positive Aspect, 4 Negative Aspect, 3 Tension, and 5 Challenge) and player experience of need satisfaction (PENS) (with 17 tasks, namely 9 Presence, 3 Autonomy, 2 Relatedness, and 3 Intuitive Control) show that all components and variables from each instrument have a Cronbach's Alpha value of more than 0.7, thus making all components reliable.

3.3.   Method Results and Analysis

Based on the respondent answers of the Blue Archive mobile video games questionnaire, the evaluation results obtained from the data processed using the game experience questionnaire (GEQ) and player experience of need satisfaction (PENS) methods aim to provide analytical results from the questionnaire and will be displayed in the form of diagrams. The result of this data analysis can be seen based on the sub-elements of the game experience questionnaire (GEQ) and player experience of need satisfaction (PENS) methods themselves.

3.3.1. Game Experience Questionnaire (GEQ) Statistics Results
The following is the diagram of the GEQ statistic result:

Figure 2. Game Experience Questionnaire (GEQ) Core Module Statistic Result Diagram

The picture above shows a diagram of a result from the evaluation of the game experience questionnaire (GEQ) Core Questionnaire. The game experience questionnaire (GEQ) Core Questionnaire is used to assess the experience of the respondents when playing Blue Archive mobile video games.

Based on the diagram in Figure 2 above, the aspect of Immersion has a score value of 4.22. Which means that the respondents are well immersed while engaging in the game; Flow aspect has a score value of 2.66. Which means that the respondents are not really or quite interested in or even understand the flow of the game; Competence has a score value of 3.25. This means that the players are fairly competent and have well-performed in the game; Positive Aspect have a score value of 4.38. This shows that the players are having a positive experience and do enjoy and feel content with the game; Negative Aspect has a score value of 2.47. This shows that the players experience a slight negative influence when they play the game, showing a bit of negative experience from the game caused by technical issues, bugs, and/or extended maintenance; Tension has a score value of 2.44. Which means that the players are having a slight tension and annoyance feeling related to the game; Challenge has a score value of 3.02. Which means that the players are having a slight to moderate difficulty and feel quite challenged by the game.

Based on the average value of every aspect combined, the Core Questionnaire of the game experience questionnaire (GEQ) component gets a score value of 3.21. It shows that respondents are having a good player experience when they are playing the Blue Archive mobile video games, and the respondents have an adequate ability to play the Blue Archive mobile video games, as shown by the high score value of Positive Aspect, Competence, and Immersion. However, the low Flow aspect gives poor results in terms of overall flow for the player when playing the Blue Archive mobile video games.

3.3.2. Player Experience of Need Satisfaction (PENS) Statistics Results
The following is the diagram of the PENS statistic result:

Score Component of PENS

Presence — 3.490909

Intuitive Control — 4.40303

Autonomy — 3.833333

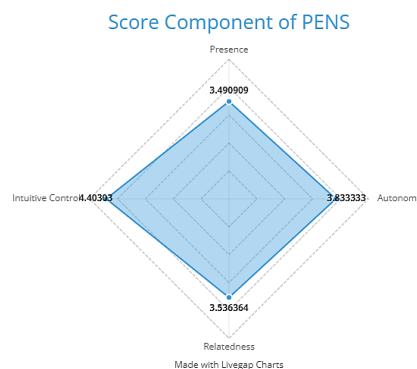Relatedness — 3.536364

Made with Livegap Charts

Figure 3. Player Experience of Need Satisfaction (PENS) Statistic Result Diagram

The picture above shows a diagram of a result from the evaluation of the player experience of need satisfaction (PENS) questionnaire. The player experience of need satisfaction (PENS) is used to evaluate and measure the player experience in need of satisfaction of the respondents in playing the Blue Archive mobile video games.

Based on the diagram shown in Figure 3, Presence has a score value of 3.49, which indicates that the respondents are experiencing a moderate level of feeling the presence of the game environment of the Blue Archive mobile video games.

Autonomy has a score value of 3.83. This means that the players that play the Blue Archive mobile video games are able to decide, organize, and freely choose their own experience in the game, and they are satisfied by the game's design of elements and techniques, which provides them with the ability to express themselves in the game with an acceptable amount of restraints to keep them on track with the game's main storyline and primary objective.

Relatedness has a score value of 3.53. Which means that the players that play the Blue Archive mobile video games are able and capable of feeling related to one another and have a sense of being included in a social environment, meaning that they have a desire to connect, feel authentic and supportive in the game, and to create or join a team or community of the game itself.

Intuitive Control has a score value of 4.40. Meaning that the players found that the controls of the Blue Archive mobile video games are easy to understand and also user-friendly, allowing them to convey their intention into the game, easily make sense of the game, and master the game without having much difficulty.

Based on the average value of every aspect combined, the player experience of need satisfaction (PENS) component gets a score value of 3.81. It shows that respondents are also having a good player experience when they are playing the Blue Archive mobile video games, and the respondents have their need for satisfaction in the Blue Archive mobile video games well satisfied, which motivated them to play the game, as shown by the high score value of each aspect of Presence, Autonomy, Relatedness and Intuitive Control.

D. Conclusion

According to the conclusion obtained from the player experience evaluation research on Blue Archive mobile video games by using the game experience questionnaire (GEQ) and player experience of need satisfaction (PENS) methods, the number of respondents was as high as 110. resulting in the analysis and evaluation discussion that have been included in the diagram, namely:

1. The analysis result on the game experience questionnaire (GEQ) Core Module shows that the respondents felt more positive effects than negative effects when playing Blue Archive mobile video games. Respondents have the ability to play the Blue Archive mobile video games, as shown by high scores on Positive Aspect, Competence, and Immersion. However, the Tension aspect shows a rather low score, which means that this Blue Archive mobile video game lacks tension and challenges that make it difficult and engaging to play for the players. Then the Flow aspect, which also has a low score, makes the game have a poor flow for players when playing it.
2. The analysis result on the player experience of need satisfaction (PENS) shows that the overall aspects such as Presence, Relatedness, and Autonomy have fairly high scores, which means that the Blue Archive mobile video games is able to make their players feel the presence and the story of the game as well as relate to the other players that also play the game, and also have good autonomy in how the players are able to choose their own

experience in the game. And for the highest score, which belongs to Intuitive Control, meaning that the game has excellent and easy-to-understand control that doesn't make the players feel troubled when they play the game.

According to both the game experience questionnaire (GEQ) and the player experience of need satisfaction (PENS), the respondents experience a good player experience, although there are some constraints on the Tension and Flow aspects that give the players a slight negative effect on the game. It can be concluded that both the game experience questionnaire (GEQ) and the player experience of need satisfaction (PENS) can be used together to scale the level of player experience and their need for satisfaction in order to provide input and/or feedback for game development.

Since this study was conducted quantitatively, it is possible to conduct the same kind of study qualitatively and observationally with the direct respondent, which could potentially enhance the findings by providing insights from the perspective of recency within the game experience. Qualitative and/or observational methods may improve comprehension of the dynamic nature of player experience and the need for satisfaction in mobile video games by providing more in-depth insights into the subtleties of player perceptions, emotions, and behaviors.

E. References

[1] F. Pallavicini, A. Ferrari, and F. Mantovani, "Video games for well-being: A systematic review on the application of computer games for cognitive and emotional training in the adult population," *Front Psychol*, vol. 9, p. 2127, 2018.

[2] Ç. Aker, K. Rızvanoğlu, Y. İnal, and A. S. Yılmaz, "Analyzing playability in multi-platform games: a case study of the Fruit Ninja Game," in *Design, User Experience, and Usability: Novel User Experiences: 5th International Conference, DUXU 2016, Held as Part of HCI International 2016, Toronto, Canada, July 17–22, 2016, Proceedings, Part II 5*, Springer, 2016, pp. 229–239.

[3] J.-L. Wang, J.-R. Sheng, and H.-Z. Wang, "The association between mobile game addiction and depression, social anxiety, and loneliness," *Front Public Health*, vol. 7, p. 247, 2019.

[4] D. Desai and A. Kaiwade, "The effects of mobile games on male adolescents using data mining techniques-A review," *International Journal of Computer Applications Technology and Research*, vol. 9, no. 01, 2020.

[5] D. Y. Jin, "The emergence of asian mobile games: definitions, industries, and trajectories," *Mobile Gaming in Asia: Politics, Culture and Emerging Technologies*, pp. 3–20, 2017.

[6] J. Wiemeyer, L. Nacke, C. Moser, and F. 'Floyd'Mueller, "Player experience," *Serious games: Foundations, concepts and practice*, pp. 243–271, 2016.

[7] V. Vanden Abeele, K. Spiel, L. Nacke, D. Johnson, and K. Gerling, "Development and validation of the player experience inventory: A scale to measure player experiences at the level of functional and psychosocial consequences," *Int J Hum Comput Stud*, vol. 135, p. 102370, 2020.

[8] W. A. Ijsselsteijn, Y. A. W. de Kort, K. Poels, A. Jurgelionis, and F. Bellotti, "Characterising and measuring user experiences in digital games," in *conference; ACE 2007; 2007-06-13; 2007-06-15*, 2007, pp. 1–4.

[9]   N. Lazzaro, "The four fun keys. game usability: Advancing the player experience (K. Isbister and N. Schaffer, eds.)." Burlington: Elsevier, 2008.

[10]   M. Mora-Cantallops and M.-Á. Sicilia, "Exploring player experience in ranked League of Legends," *Behaviour & Information Technology*, vol. 37, no. 12, pp. 1224–1236, Dec. 2018, doi: 10.1080/0144929X.2018.1492631.

[11]   K. M. Gerling, M. Klauser, and J. Niesenhaus, "Measuring the impact of game controllers on player experience in FPS games," in *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, 2011, pp. 83–86.

[12]   D. Johnson, M. J. Gardner, and R. Perry, "Validation of two game experience scales: The Player Experience of Need Satisfaction (PENS) and Game Experience Questionnaire (GEQ)," *Int J Hum Comput Stud*, vol. 118, pp. 38–46, 2018, doi: https://doi.org/10.1016/j.ijhcs.2018.05.003.

[13]   W. A. IJsselsteijn, Y. A. W. De Kort, and K. Poels, "The game experience questionnaire," 2013.

[14]   L. E. Nacke, M. N. Grimshaw, and C. A. Lindley, "More than a feeling: Measurement of sonic user experience and psychophysiology in a first-person shooter game," *Interact Comput*, vol. 22, no. 5, pp. 336–343, 2010, doi: https://doi.org/10.1016/j.intcom.2010.04.005.

[15]   L.-C. Law, F. Brühlmann, and E. Mekler, *Systematic Review and Validation of the Game Experience Questionnaire (GEQ) – Implications for Citation and Reporting Practice*. 2018. doi: 10.1145/3242671.3242683.

[16]   R. M. Ryan, C. S. Rigby, and A. Przybylski, "The motivational pull of video games: A self-determination theory approach," *Motiv Emot*, vol. 30, pp. 344–360, 2006.

[17]   K. Ijaz, N. Ahmadpour, Y. Wang, and R. A. Calvo, "Player experience of needs satisfaction (PENS) in an immersive virtual reality exercise platform describes motivation and enjoyment," *Int J Hum Comput Interact*, vol. 36, no. 13, pp. 1195–1204, 2020.

[18]   J. Högberg, J. Hamari, and E. Wästlund, "Gameful Experience Questionnaire (GAMEFULQUEST): an instrument for measuring the perceived gamefulness of system use," *User Model User-adapt Interact*, vol. 29, no. 3, pp. 619–660, 2019.

[19]   D. Rato, F. Correia, A. Pereira, and R. Prada, "Robots in games," *Int J Soc Robot*, vol. 15, no. 1, pp. 37–57, 2023.

[20]   M. Pratama, Y. Yanfi, and P. D. Nusantara, "WizardOfMath: A top-down puzzle game with RPG elements to hone the player's arithmetic skills," *Procedia Comput Sci*, vol. 216, pp. 338–345, 2023, doi: https://doi.org/10.1016/j.procs.2022.12.144.

[21]   G. Tao, B. Garrett, T. Taverner, E. Cordingley, and C. Sun, "Immersive virtual reality health games: a narrative review of game design," *J Neuroeng Rehabil*, vol. 18, pp. 1–21, 2021.

[22]   S. S. Sabet, C. Griwodz, and S. Möller, "Influence of primacy, recency and peak effects on the game experience questionnaire," in *Proceedings of the 11th ACM Workshop on Immersive Mixed and Virtual Environment Systems*, 2019, pp. 22–27.

[23] G. Hookham and K. Nesbitt, "A systematic review of the definition and measurement of engagement in serious games," in *Proceedings of the australasian computer science week multiconference*, 2019, pp. 1–10.

[24] F. Pallavicini and A. Pepe, "Comparing player experience in video games played in virtual reality or on desktop displays: Immersion, flow, and positive emotions," in *Extended abstracts of the annual symposium on computer-human interaction in play companion extended abstracts*, 2019, pp. 195–210.

[25] P. Palee, N. Wongta, K. Khwanngern, W. Jitmun, and N. Choosri, "Serious Game for Teaching Undergraduate Medical Students in Cleft lip and Palate Treatment Protocol," *Int J Med Inform*, vol. 141, p. 104166, 2020, doi: https://doi.org/10.1016/j.ijmedinf.2020.104166.

[26] N. Zulfa, D. Yuniasri, P. Damayanti, D. Herumurti, and A. A. Yunanto, "The Effect of UI and UX Enhancement on Bomberman Game Based on Game Experience Questionnaire (GEQ)," in *2020 International Seminar on Application for Technology of Information and Communication (iSemantic)*, 2020, pp. 543–547. doi: 10.1109/iSemantic50169.2020.9234220.

[27] C. Bäcklund, P. Elbe, H. M. Gavelin, D. E. Sörman, and J. K. Ljungberg, "Gaming motivations and gaming disorder symptoms: A systematic review and meta-analysis," *J Behav Addict*, vol. 11, no. 3, pp. 667–688, 2022.

[28] A. C. Holding, J. Verner-Filion, D. Lalande, B. J. I. Schellenberg, and R. J. Vallerand, "The roles of need satisfaction and passion in symptoms of behavioral addiction: The case of video gaming and gambling.," *Motiv Sci*, vol. 7, no. 3, p. 345, 2021.

[29] M. Kosa and A. Uysal, "Need frustration in online video games," *Behaviour & Information Technology*, vol. 41, no. 11, pp. 2415–2426, 2022.

[30] D. J. Mills, M. Milyavskaya, J. Mettler, and N. L. Heath, "Exploring the pull and push underlying problem video game use: A Self-Determination Theory approach," *Pers Individ Dif*, vol. 135, pp. 176–181, 2018.

[31] F. Stenseng, J. Falch-Madsen, and B. W. Hygen, "Are there two types of escapism? Exploring a dualistic model of escapism in digital gaming and online streaming.," *Psychology of Popular Media*, vol. 10, no. 3, p. 319, 2021.

[32] Y. Qin, "Attractiveness of game elements, presence, and enjoyment of mobile augmented reality games: The case of pokémon go," *Telematics and Informatics*, vol. 62, p. 101620, 2021.

[33] S. Adinolf and S. Türkay, "Differences in Player Experiences of Need Satisfaction Across Four Games.," in *DiGRA Conference*, 2019.

[34] K. Poels, Y. A. W. de Kort, and W. A. IJsselsteijn, "D3. 3: Game Experience Questionnaire: development of a self-report measure to assess the psychological impact of digital games," 2007.

[35] D. Johnson, L. E. Nacke, and P. Wyeth, "All about that base: differing player experiences in video game genres and the unique case of moba games," in *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 2015, pp. 2265–2274.

[36] W. Inchamnan, "An analysis of creative process learning in computer game activities through player experiences.," *IAFOR Journal of Education*, vol. 4, no. 2, pp. 119–139, 2016.