

Exploring User Engagement in AR Games : Healthy Pleasures and Remote Interactions in Pikmin Bloom

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Abstract

The modern gaming industry has evolved beyond entertainment and has become a platform for emotional satisfaction and social connection. It also sets new lifestyle trends through user-centered experience design. This study examines how Healthy Pleasure and contactless interactions influence user experience and game engagement with focus on Pikmin Bloom as a case study. News and community data were collected from November 2021 to October 2024 and analyzed through word frequency analysis and TF-IDF to identify key design success factors and user experience characteristics. The results show that Pikmin Bloom successfully integrates physical activity with digital social interactions, which significantly contributed to user engagement and the formation of a dedicated fandom. News data highlighted the effective use of augmented reality (AR) technology to promote physical activity and well-being. Meanwhile, community data revealed user experiences and emotional responses that fostered sustained connection and engagement. These findings emphasize the importance of adaptive mechanics, dynamic goal setting, cross-platform integration, and personalized content delivery to design games that blend healthy pleasures with contactless interactions.

Keyword : Healthy Pleasures, Non-Face-to-Face Interaction, Augmented reality gaming, User engagement, Pikmin Bloom

1. Introduction

The modern gaming industry has evolved beyond serving as a provider of leisure activities to offering emotional satisfaction and facilitating social interactions. It has established itself as a critical tool for creating innovative experiences in digital environments. Following the pandemic, the importance of physical well-being and emotional stability has gained significant attention. This shift has highlighted the value of game designs that integrate physical activities with digital interactions. These developments enhance user experiences and engagement while presenting opportunities for sustainable growth in the

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gaming industry. Pikmin Bloom exemplifies this trend. It is an augmented reality (AR)-based mobile game that combines walking activities with physical well-being and digital experiences [1]. Additionally, in response to the growing emphasis on contactless interactions in the post-pandemic era, the game includes features that promote digital communication and support relationship-building among users. These elements align with societal trends and have garnered positive responses from users. Although there has been considerable research on healthy pleasure and contactless interactions, studies often focus on conceptual frameworks or technical implementations. However, there is a lack of in-depth analysis regarding how these elements are cohesively integrated within the contexts of game design and user experience.

This study focuses on Pikmin Bloom to analyze how the modern trends of Healthy Pleasure and contactless interactions influence user experience and game engagement. By examining how these elements contributed to user engagement and the formation of fandoms, the study seeks to provide new insights into contemporary game design and marketing strategies. To achieve this, three years of Korean news and community data were collected and analyzed. The data span the period from November 1, 2021, to October 31, 2024. The data collection began on November 2, 2021, coinciding with the release date of Pikmin Bloom.

2. Theoretical Background

2.1 Healthy Pleasure

Healthy Pleasure is a concept that integrates health maintenance with enjoyment. It encourages activities such as eating nutritious foods and exercising to stay fit. This approach ensures that wellness pursuits are perceived as enjoyable rather than forced or burdensome [2]. Unlike traditional healthcare approaches that may focus on discipline or obligation, this concept emphasizes making health-related activities a source of pleasure. Particularly, as modern individuals face increasing stress levels and show heightened interest in achieving work-life balance, there is a growing recognition that healthcare practices should incorporate elements of enjoyment. Following the COVID-19 pandemic, the focus on health and wellness has intensified, bringing casual physical activities and the sense of accomplishment they provide into sharper focus [3].

Social media has played a significant role in reinforcing the healthy pleasure trend. Various workout routines and healthy recipes are shared widely. This sharing process inspires and motivates individuals to embrace healthier lifestyles by encouraging mutual support and interaction. This shared encouragement

creates a cycle of positive reinforcement and helps individuals stay motivated to care for their health. Furthermore, healthy pleasures extend beyond individual well-being to foster social connections. Activities like running crews and hiking groups offer opportunities for people to bond over shared hobbies. These activities promote integrated well-being by combining physical health, emotional satisfaction, and meaningful social relationships.

2.2 Expansion of non-face-to-face interactions and social games

Non-face-to-face interactions enable users to form indirect relationships regardless of physical distance and provide a sense of social connection and belonging [4]. This approach has gained importance in digital content, particularly in the post-pandemic environment, as social distancing and other environmental factors have reshaped how people interact. Since the declaration of the COVID-19 pandemic in 2020, various industries have focused on delivering new experiences and services based on contactless culture. For instance, digital content such as online concerts, virtual exhibitions, and metaverse-based interactions has expanded the scope of contactless culture. This expansion provides users with opportunities to experience innovation and engagement in novel ways [5][6]. Similarly, activities like screen golf have emerged as notable examples of replacing traditional face-to-face interactions in a contactless environment [7]. This trend extends beyond the advancement of contactless content and redefines social interactions across various digital environments. It encompasses areas such as the gaming industry, where it enhances emotional satisfaction and fosters a sense of connection among users.

These features have also contributed to building a strong fandom culture. Social games amplify these benefits by strengthening user relationships through collaborative quests and shareable content [8]. These features have resonated particularly well with digital natives, such as Generation MZ [9], and have been a key success factor for Pikmin Bloom. These non-face-to-face interactions are now playing a pivotal role in redefining post-pandemic gaming as more than a leisure activity. They have positioned games as tools for providing emotional stability and fostering a sense of social connection among users.

2.3 AR-Driven Gamification

AR is a technology that overlays virtual information onto the real world by calculating the position and angle of a camera's image. This process provides users with an interactive environment that bridges digital and physical realms [10]. By linking physical activities to virtual elements, AR enables users to alter the in-game world through actions like walking or moving. It also enhances the sense of

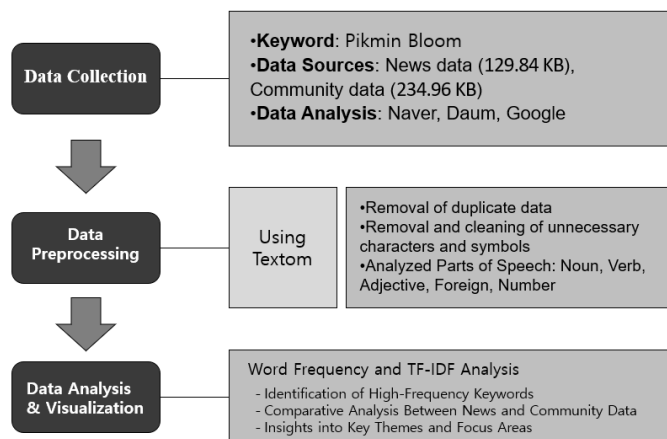
accomplishment by offering visual feedback, which reinforces user engagement [11]. The unique nature of AR-based games effectively merges real and virtual elements in order to enhance user immersion and promotes emotional satisfaction as well as self-efficacy [12]. This indicates that modern game design is advancing toward maximizing user experience and integrating digital technologies into daily life. It gamifies physical spaces in the real world and offers experiences that surpass the simple achievement of virtual objectives. These experiences are deeply connected to users' daily lives. This connection creates a seamless interaction between gameplay and real-world activities [13]. This combination of physical and digital experiences offers users more than simple entertainment. It encourages them to find a sense of accomplishment in their everyday activities and deepens their engagement with the game.

3. Research Methods

3.1 Research Design

This study applied text mining techniques to transform unstructured text data into structured information for analysis [14]. For data collection and analysis, the study utilized Textom (www.textom.com), a systematic platform designed to gather news and community data efficiently. After the data collection phase, word frequency analysis and TF-IDF analysis were conducted to extract keywords and topics related to Pikmin Bloom.

The research process followed three main steps: 1) data collection, 2) data preprocessing, and 3) data analysis [15]. [Fig. 1] summarizes the research process.



[Fig. 1] Entire Data Analysis Procedure

In the first step, the Textom platform was used to gather unstructured texts. These texts consisted of various sources such as news articles and community posts. This approach ensured the inclusion of diverse and relevant data for the analysis. Keywords relevant to the research topic were predefined to ensure that the selected texts had strong relevance, while duplicate or irrelevant data were minimized by applying specific filtering criteria. In the second step, preprocessing techniques were applied to refine the collected data for accuracy and relevance. This involved removing unnecessary elements such as advertising phrases and redundant sentences, which helped improve the quality and reliability of the data. These measures ensured that the analysis would yield precise and dependable results. In the final step, the preprocessed data was used to conduct word frequency analysis and TF-IDF analysis. Word frequency analysis identified user interests and key features of Pikmin Bloom by calculating the occurrence rates of various words in the dataset. TF-IDF analysis determined the relative importance of specific words within the text, uncovering significant topics and concepts related to the game. This multi-step process enabled a comprehensive understanding of user experiences, healthy leisure trends, and the impact of non-face-to-face social interactions in the context of Pikmin Bloom.

3.2 Data collection and refinement

This study collected data from November 1, 2021, to October 31, 2024, using 'Pikmin Bloom' as the main keyword. Data was sourced from key platforms in Korea with active user participation. For news data, sources included Google News, Naver News, and Daum News, while community data was collected from Google Facebook, Naver Cafe, Naver Knowledge (Intellectual), and Daum Cafe. The collected data comprised titles, bodies, and URLs, with a total size of 129.84 KB for news data and 234.96 KB for community data.

To analyze the data, Mecab, a morphological analysis tool, was utilized. Mecab is highly effective for Korean text analysis because it ensures accurate parsing and operates at high processing speeds. It allowed the collected text data to be structured and transformed in alignment with the study's objectives. During the data preprocessing stage, duplicate data was removed, and unnecessary characters and symbols were eliminated to ensure text cleanliness. Duplicates were identified by comparing exact matches within titles and bodies. The analysis focused on specific parts of speech, including nouns, verbs, adjectives, foreign words, and numbers, extracting meaningful semantic units to structure the data effectively.

3.3 Analysis Methods

Word frequency analysis is a widely used method to identify frequently occurring words in a text. This approach allows researchers to determine the primary topics or keywords within a document, providing insights into its main themes [16]. In this study, word frequency analysis was performed on news and community data to uncover key themes and issues related to Pikmin Bloom. This analysis helped highlight the distribution of keywords related to user experience and their influence on game engagement.

Term Frequency-Inverse Document Frequency (TF-IDF) analysis was also employed to evaluate the relative importance of words. TF-IDF combines the frequency of a word in a document (TF) with the rarity of its appearance across all documents (IDF) to identify significant terms [17]. This method addresses the limitations of simple frequency analysis by highlighting words that carry substantial meaning. In this study, TF-IDF analysis was used to identify critical words associated with Pikmin Bloom in both news and community data. The analysis compared the primary keywords in both datasets to determine the focus and emphasis of discussions surrounding the game.

4. Analysis Results

4.1 News Data Analysis

The analysis of news data resulted in a total of 1,374 unique words. The top 12 keywords identified through word frequency and TF-IDF analysis are presented in [Table 1].

The word frequency analysis revealed that the most frequently used keywords were 'Pikmin' (626), 'Bloom' (353), 'Game' (285), 'Stroll' (63), 'Challenge' (50), and 'Flower' (33). Among these, 'Pikmin' (626), 'Bloom' (353), and 'Game' (285) are closely related to the game's title, indicating strong interest in Pikmin Bloom from news coverage. The keywords 'Stroll' and 'Challenge' highlight the game's design approach, which successfully connects physical activity with a sense of accomplishment, as it turns walking into an engaging, goal-oriented activity.

The TF-IDF analysis produced slightly different results, with 'Deco' (191.1), 'Stroll' (111.7), 'Challenge' (94.5), and 'Community' (87.9) ranking as the top keywords. 'Deco' reflects the significance of visual feedback in the game, specifically related to decorative elements, and contributes to enhancing the player's sense of immersion. 'Stroll' and 'Challenge' further illustrate how the game links users'

physical activity to goal-setting mechanics. This approach fosters emotional satisfaction and creates opportunities for sustained engagement by effectively integrating physical actions with gameplay objectives. Notably, 'Stroll' serves as a core feature that connects physical activity with gameplay. This feature allows players to experience well-being and a sense of achievement through their daily walking activities. This keyword represents a key example of gamification, where walking drives in-game progress and maintains player motivation over time. The keyword 'Community' highlights the game's emphasis on facilitating indirect social interactions among users. It represents how Pikmin Bloom provides a sense of connection in a non-face-to-face environment. This design reflects the trend of contactless interaction and demonstrates the game's adaptation to contemporary social needs.

[Table 1] Word frequency of news data and top 12 keywords by TF-IDF analysis

Rank	Keyword	Frequency	Keyword	TF/IDF
1	Pikmin	626	Deco	191.1458676
2	Bloom	353	Event	127.9048831
3	Game	285	Addition	116.1262375
4	Deco	177	Stroll	111.7032422
5	AR	142	Anniversary	95.34729865
6	Event	100	Challenge	94.54251859
7	Addition	92	AR	94.46385173
8	Age	76	Day	94.07374452
9	Stroll	63	Appearance	93.00393566
10	Release	53	Pokemon	89.38800598
11	Pokemon	52	Community	87.85591678
12	Appearance	50	Age	86.41797128

These findings demonstrate that Pikmin Bloom effectively incorporates trends such as healthy pleasures and contactless interactions. The game ensures that users experience satisfaction and immersion by seamlessly integrating these elements into its design.

4.2 Analyzing Community Data

The analysis of community data identified a total of 2,362 unique words. The top 12 keywords obtained through word frequency and TF-IDF analysis are presented in [Table 2].

Word frequency analysis showed that the most frequently used keywords were 'Pikmin' (935), 'Bloom' (439), 'Game' (224), 'Step' (99), 'Flower' (97), and 'Friend' (90). Among these, 'Step' and 'Friend' highlight game features that encourage indirect interaction among users based on their daily

walking activities. These keywords demonstrate how users integrate physical activity with digital communication through the game. This integration enhances their sense of social connection by fostering interactions that bridge physical actions and virtual environments.

[Table 2] Word frequency of community data and top 12 keywords by TF-IDF analysis

Rank	Keyword	Frequency	Keyword	TF/IDF
1	Pikmin	935	Game	261.2221785
2	Bloom	439	Step	197.7493279
3	Game	224	Flower	195.5675289
4	Step	99	Postcard	185.5281718
5	Flower	97	Friend	179.7721163
6	Friend	90	App	174.7826593
7	App	81	Seedling	169.5742026
8	Seedling	77	Deco	169.5709962
9	Deco	73	Nintendo	163.9118524
10	Walk	72	Mushroom	155.5906524
11	Nintendo	69	Walk	147.9330988
12	Postcard	68	Start	127.4715204

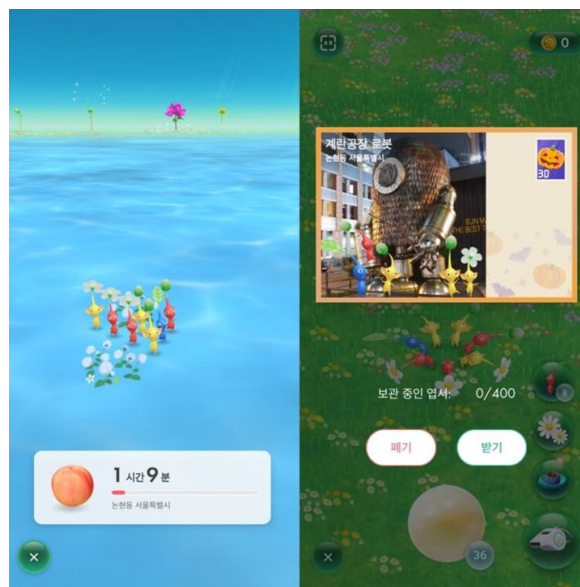
TF-IDF analysis revealed that the top keywords were ‘Step’ (197.7), ‘Flower’ (195.6), ‘Postcard’ (185.5), ‘Friend’ (179.8), and ‘App’ (174.8). The terms ‘Step’ and ‘Postcard’ reflect how users create new forms of social experiences by combining everyday activities with digital interactions. Specifically, ‘Postcards’ serve as a key game element that facilitates cooperation and communication between users. This feature appears to have maximized the effectiveness of post-pandemic indirect interactions. Users gain satisfaction from collaboration and communication by sending and receiving mobile postcards with their friends, which provides a sense of accomplishment and fosters social bonding. These interactions strengthen the connection between players and act as a crucial motivator to maintain engagement in the game.

Pikmin Bloom transcends the framework of a walking-based game by demonstrating how well-designed non-face-to-face interactions can deliver both social connection and emotional satisfaction to its users.

5. Discussion

The analysis of news and community data revealed that designs combining physical activity with

digital social interactions significantly enhance user engagement and foster fandom in the modern gaming industry. The news data emphasized the effective integration of healthy pleasures and augmented reality technology. This combination demonstrates how the intent and implementation of game design can naturally support physical activity and well-being. The integration of GPS-based AR technology gamified walking activities and organically connected these activities with game objectives. This approach appears to have enabled users to experience both physical health benefits and emotional satisfaction simultaneously. In contrast, community data highlighted specific aspects of user experience, such as fostering a sense of connection and promoting sustained engagement through emotional responses. As illustrated in [Figure 2], Pikmin characters set out on explorations and return with postcards containing photographs that incorporate real-world objects as their background [18]. The system enhanced the connection between virtual experiences and reality.



[Fig. 2] Pikmin returning from exploration with nectar and postcards

In addition, the visual feedback generated by planting virtual flowers along walking routes and transforming the environment provided users with both immersion and emotional satisfaction [19]. Features such as mobile postcard sending and friend invitations, based on the characteristics of contactless interaction, facilitated indirect yet emotionally significant communication among players [20]. This design demonstrates that Pikmin Bloom serves as a successful example of effectively incorporating the trends of healthy pleasures and contactless interactions. It also reaffirms the importance of

user-centered experiences in modern game design and highlights their role in shaping successful and engaging gameplay. Moreover, it highlights how the integration of healthy pleasures with contactless interactions in game design can evoke positive emotions and encourage sustained engagement, especially in adapting to communication shifts in the post-pandemic era. *Pikmin Bloom* goes beyond simple entertainment. It fulfills users' emotional needs and strengthens social connections, which highlights its significant contribution to modern interactive experiences. This approach could lead to new directions in modern game design and marketing strategies and contribute to greater sustainability in the gaming industry as a whole.

6. Conclusion

This study aimed to examine the impact of healthy pleasures and non-face-to-face interactions on user experience and game engagement by using *Pikmin Bloom* as a case study. To achieve this, news and community data from November 2021 to October 2024 were collected and analyzed with word frequency and TF-IDF techniques to identify the critical success factors of game design and key characteristics of user experience.

This study has limitation with its lack of in-depth contextual analysis of texts and emotional responses. Thus, further research can be done to include comparative studies of similar games utilizing AR technology to evaluate how healthy pleasures and contactless interactions impact different user demographics. In addition, further research can clarify the relationship between key in-game events and user reactions using time-series analysis. Sentiment analysis techniques can be employed to deeply understand emotional changes during user experiences in order to identify specific interactions between design elements and user emotions.

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