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DESIGNING USER EXPERIENCES IN CASUAL GAMES TO ENHANCE PRODUCT KNOWLEDGE

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Abstract—*The widespread adoption of mobile platforms has transformed the gaming industry, making casual games highly popular due to their accessibility via smartphones and tablets. Beyond entertainment, casual games now serve as effective educational and marketing tools for delivering product knowledge. This study explores how user experience (UX) design can enhance product education in casual games by focusing on game mechanics, UX principles, narrative engagement, and product placement. Using a Design-Based Research (DBR) approach, this study develops, tests, and refines interactive experiences to ensure the effective implementation of design elements. Testing with 50 participants showed a 30% improvement in product recall after playing, along with high satisfaction levels regarding game usability and engagement. Participants also demonstrated improved time management skills and emotional connection to the game content. The game integrates challenges and activities designed to build cognitive and emotional engagement. Artificial intelligence (AI) technology is utilized through Unreal Engine to create a realistic and immersive environment. By incorporating product information into engaging gameplay, the game serves as both an educational and entertainment tool. This research provides practical insights for game developers, marketers, and educators on integrating educational content into casual games. By leveraging AI, user testing, and advanced UX strategies, casual games can become effective tools for game-based marketing and education. This game significantly enhances product knowledge retention, user engagement, and practical skills.*

Keywords: *game design, ux design, unreal engine, product knowledge.*

Abstrak—*Adopsi luas platform mobile telah mengubah industri game, menjadikan game kasual sangat populer karena kemudahannya diakses melalui smartphone dan tablet. Selain sebagai hiburan, game kasual kini juga berfungsi sebagai alat edukasi dan pemasaran yang efektif untuk menyampaikan pengetahuan produk. Penelitian ini mengeksplorasi bagaimana desain pengalaman pengguna (UX) dapat meningkatkan edukasi produk dalam game kasual dengan berfokus pada mekanisme game, prinsip UX, keterlibatan narasi, dan penempatan produk. Dengan menggunakan pendekatan penelitian berbasis desain (Design-Based Research/DBR), studi ini mengembangkan, menguji, dan menyempurnakan pengalaman interaktif untuk memastikan penerapan elemen desain yang efektif. Pengujian dengan 50 peserta menunjukkan peningkatan daya ingat produk sebesar 30% setelah bermain, serta tingkat kepuasan yang tinggi terhadap kegunaan dan keterlibatan game. Peserta juga menunjukkan peningkatan kemampuan manajemen waktu dan keterhubungan emosional dengan konten game. Game ini mengintegrasikan tantangan dan aktivitas yang dirancang untuk membangun keterlibatan kognitif dan emosional. Teknologi kecerdasan buatan (AI) digunakan melalui Unreal Engine untuk menciptakan lingkungan yang realistis dan imersif. Dengan menggabungkan informasi produk ke dalam gameplay yang menarik, game ini berfungsi sebagai alat edukasi sekaligus hiburan. Penelitian ini memberikan wawasan praktis bagi pengembang game, pemasar, dan pendidik tentang cara mengintegrasikan konten edukasi ke dalam game kasual. Dengan memanfaatkan AI, pengujian pengguna, dan strategi UX yang canggih, game kasual dapat menjadi alat yang efektif untuk*

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pemasaran berbasis permainan dan edukasi. Game ini mampu secara signifikan meningkatkan retensi pengetahuan produk, keterlibatan pengguna, dan keterampilan praktis.

***Kata Kunci**:* game design, ux design, unreal engine, product knowledge.

INTRODUCTION

Casual games have become highly popular in the digital era, offering marketers a unique platform to introduce products through engaging and interactive experiences. These games are widely accessible via mobile devices, attracting a diverse demographic of players [1]. However, designing user experiences (UX) in casual games to effectively enhance product knowledge presents a significant challenge. While these games excel at capturing user attention, the specific UX strategies that optimize engagement and product learning are not yet well understood. Recent studies have highlighted the importance of integrating educational and marketing elements into gameplay to improve product recall and engagement [2], but further exploration is needed to determine how UX design can balance entertainment with education [3].

The growing popularity of gamification in industries such as marketing, education, and healthcare has demonstrated the potential of game-like experiences to drive user engagement and knowledge retention. Casual games, as a subset of this trend, offer a unique blend of entertainment and interactivity, making them an ideal platform for delivering educational content seamlessly [13]. By incorporating mechanics such as progression systems, feedback loops, and real-time decision-making, casual games can mimic real-world scenarios, enabling players to learn about products or services in an intuitive and immersive way. These developments highlight the importance of designing UX strategies that align gameplay with specific learning objectives, thereby enhancing both user satisfaction and knowledge acquisition.

While the potential of casual games as educational tools is widely acknowledged, the process of designing effective user experiences remains a challenge. The diversity of players' preferences and learning styles requires game developers to balance entertainment with instructional content, ensuring that gameplay remains engaging while delivering meaningful product knowledge [14]. Moreover, poorly designed UX can result in players disengaging from the game or failing to retain the intended information. Addressing these challenges involves not only leveraging advanced technologies like AI and personalization but also understanding how game mechanics can be optimized to deliver targeted educational outcomes. These complexities underline the need for a systematic approach to UX design in casual games, which this study seeks to address.

Casual game design has evolved to incorporate innovative marketing strategies such as in-game advertisements, branded content, and reward-based systems. Research indicates that embedding product interactions directly into the game mechanics, rather than relying solely on passive advertisements, significantly improves players' retention of product knowledge [4]. By integrating product messages into the natural flow of gameplay, these interactions ensure that players absorb information more effectively, resulting in a deeper understanding of product features [5]. Features such as leaderboards, multiplayer modes, and personalized challenges foster social engagement, encouraging word-of-mouth promotion and increased interaction with in-game content. This inclusivity allows casual games to engage players while simultaneously promoting product knowledge [6][7].

Recent developments in casual games have also shown the potential of gamification strategies beyond traditional marketing. Studies emphasize the effectiveness of personalized challenges and dynamic feedback systems in enhancing both player satisfaction and knowledge retention. Such systems adapt gameplay based on user performance, ensuring optimal levels of engagement while subtly delivering educational or product-related content [13]. By leveraging gamification, casual games create experiences that resonate with players on a cognitive and emotional level, making them powerful tools for brand education and user immersion [14].

Moreover, the increasing integration of artificial intelligence (AI) in casual games has opened up new opportunities for designing adaptive and interactive experiences. AI-driven algorithms can analyze player behavior in real-time, adjusting game mechanics, difficulty levels, and content delivery to suit individual preferences [15]. This level of personalization not only boosts engagement but also enhances the delivery of product knowledge, as players are presented with contextually relevant information at the right moments. These advancements underline the importance of combining AI technology with user-

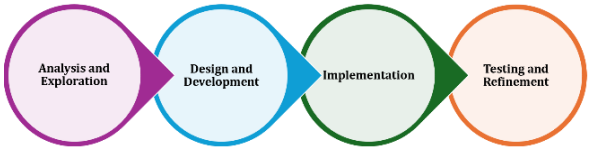
centered design to maximize the educational impact of casual games [16].

Despite these advancements, there is a notable gap in understanding how specific UX elements—such as interactive feedback, narrative progression, and player rewards—directly influence product knowledge retention. Existing research has largely focused on the impact of game mechanics on user engagement without fully addressing their educational potential [11][12]. Addressing this gap is critical to maximizing the potential of casual games as both entertainment and educational tools.

This study explores UX strategies in casual games that balance engagement and product education by leveraging interactive features, AI-driven personalization, and narrative designs. By addressing gaps in the literature, the findings provide actionable insights for game developers and marketers to better utilize casual games as tools for both entertainment and education, offering innovative approaches to integrating product knowledge into gaming environments.

MATERIALS AND METHODS

This study employs a Design-Based Research (DBR) methodology to iteratively design, develop, and test a casual game aimed at enhancing product knowledge about university life for senior high school students. DBR is chosen because it allows for the continuous refinement of the game's UX design through multiple testing cycles, aligning to optimize user engagement and product understanding. The game is designed to introduce daily life in higher education, offering high school students insights into university life through interactive gameplay.



Source: (Research Results, 2024)
Figure 1. The DBR Workflow Diagram

The DBR process is divided into four phases as shown in Figure 1:

1. Analysis and Exploration: Initial surveys and quizzes were distributed to 50 randomly selected high school students to identify what information they need and expect to learn about university life.
2. Design and Development: Based on the survey results, the game design was developed to include interactive gameplay, cinematic cameras, and AI-driven environments that simulate realistic campus life scenarios. The design of the user experience (UX) focused on integrating daily activities, mood status tracking, and player feedback mechanisms to keep students engaged.
3. Implementation: A working prototype of the game was developed using the Unreal Engine, incorporating artificial intelligence (AI) to simulate real-time responses and behaviors in the game environment.
4. Testing and Refinement: The game was evaluated using black-box testing to assess its functionality, and user testing was conducted with the same 50 participants to gather feedback on their experience and comprehension of university life.

Participants and Sampling

The participants in this study consisted of 50 high school students, aged 16–18, who were randomly selected from a pool of potential university applicants. The students were asked to engage with the casual game prototype for a period of one week. Random sampling was used to ensure diversity in gender, academic backgrounds, and familiarity with video games. The primary objective was to observe how the game's UX design influenced their understanding of daily university life.

Data Collection

Quantitative data were gathered through in-game analytics that tracked user interaction with the game environment, focusing on the completion of specific tasks related to campus life, such as attending lectures on time or completing daily challenges.

1. These tasks were mapped to key aspects of university life, such as managing a student's time for study, social activities, and self-care (as shown in Table 1 and Figure 2).

Source: (Research Results, 2024)
Figure 2. Map The Entire Mesh in The Game

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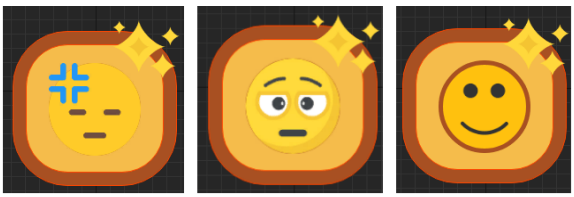
Table 1. Designing User Experince in Casual Games

Designing User Experince In Casual Games	
Place	User Experience
Home/Room: 1. Kitchen 2. Bed Room 3. Living Room 4. Bath Room Campus/college: 1. Class 2. Sport Center 3. Cafetaria 4. Toilet Public Area: 1. Walking/Jogging track 2. Garden	1. Daily Presence 2. User Bar Status: Study, Food, Clean, Fun, Sleep 3. Exploring Campus/Public Area 4. Challenge 5. Music Background
Product Knowledge: 1. The game environment is made similar to real conditions 2. The status bar is determined according to life in college such as study time, socializing time, rest time (eating, bathing etc.) 3. Placement of college attributes in the play environment 4. The environment around the campus	

Source : (Research Results, 2024)

2. Status Bar and Mood status tracking was also used to assess how well students balanced their daily schedules and how it affected their in-game performance (as shown in Figure 3 and Figure 4).

Source: (Research Results, 2024)
Figure 3. Image of The Status Bar



Source: (Research Results, 2024)
Figure 4. Image of the Status Mood

Qualitative data were collected through post-game interviews and surveys, where students were asked to reflect on their learning experiences and their understanding of university life after playing the game. Questions addressed areas such as the clarity of the game's messaging, engagement levels, and overall enjoyment.

Data Analysis

The quantitative data were analyzed using descriptive statistics to measure task completion rates and in-game performance metrics. T-tests were conducted to compare differences in product knowledge retention between students who engaged with different features of the game (e.g., narrative-driven content vs. interactive challenges).

For the qualitative data, responses were coded and analyzed thematically to identify common themes regarding user experiences and how well the game communicated information about campus life. This analysis aimed to reveal patterns in how students processed the educational content embedded in the gameplay.

RESULTS AND DISCUSSION

Interface and Game Controls

The implementation of realistic interface and game controls in the casual game design was achieved using the Camera Rotate feature within Unreal Engine, enhancing the player's ability to adjust camera angles dynamically. This feature made the game more interactive, contributing to a more immersive 3D real-time gaming experience. The system's camera rotation, which employed Code Logic, effectively addressed potential bugs and collisions in specific game situations, such as when players interacted with exit doors or engaged in cleaning actions. By setting conditions on the Touch Interface, players could intuitively control the camera's rotation and movement speed, resulting in smoother gameplay.

The design of the game environment aimed to create a realistic setting, which research has shown to be key for enhancing player engagement and immersion [17]. Figure 5 illustrates the behavior design that controls player actions and interactions. This realistic setting significantly enhanced the players' sense of immersion, in line with studies showing that believable environments increase engagement and lead to greater emotional investment in the game [18][19]. The integration of real-life scenarios, such as attending lectures or performing daily activities, enabled players to experience the game as a simulation of university life, fulfilling the objective of providing meaningful product knowledge about campus life.

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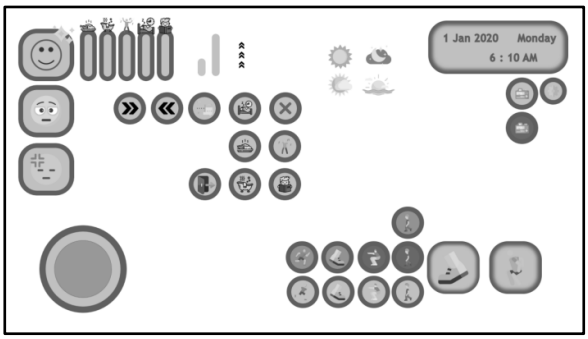

Source: (Research Results, 2024)
Figure 5. The Design of Main User Interface

Relationships between Player and Non-Player Characters (NPCs)

Social interactions were a crucial part of the casual game, with artificial intelligence (AI) controlling the behaviors of Non-Player Characters (NPCs) to simulate realistic relationships. The *Main User Interfaces* dan *Player Controller* feature (see Figure 6) allowed NPCs to react dynamically to player actions, building complex social interactions. For instance, the player's choices affected the relationship score with NPCs, which would change the NPC's behavior toward the player (e.g., positive interactions increased relationship points).

Source: (Research Results, 2024)
Figure 6. Main User Interfaces and Player Controller

AI-driven NPC behavior improved the believability of social interactions, contributing to the overall immersion of the game. This is consistent with studies suggesting that AI-driven NPCs enhance engagement by reacting to player choices in a lifelike manner, creating a more personalized and immersive experience [20][21]. Players expressed that the NPCs' emotional responses, such as joy or frustration, made the social dynamics of the game more engaging and reflective of real-life interactions [22]. This further supports the objective of the game to provide a realistic introduction to university life.

Product Knowledge Activities

One of the primary objectives of the game was to enhance product knowledge—in this case, introducing high school students to life at a university. Product knowledge was embedded in the gameplay through activities related to learning, sports, and daily routines. In particular, the Daily Campus Manager tracked player attendance in classes and participation in scheduled activities (see Figure 7).

Source: (Research Results, 2024)
Figure 7. Daily Presence Panel

In-game analytics revealed that players who engaged with the learning activities had a 75% success rate in attending classes on time, while those who failed to monitor their schedules experienced a 30% reduction in their overall performance score. The attendance score directly influenced the Daily Campus Score, with players receiving higher grades (A) for timely attendance and lower grades (D) for missing classes. This gamification of daily university life activities helped players better understand the importance of time management in a real university setting.

These activities were designed to simulate real-world consequences, such as receiving a lower score for missing classes, which helped reinforce the product knowledge that the game aimed to teach. Players' actions were dynamically evaluated, and their performance was recorded in the Daily Campus Manager, which provided continuous feedback on their progression through university life. The feedback loop supported the educational objective of the game by encouraging players to apply the knowledge they gained in a simulated environment, ultimately aiding in better product comprehension.

The results show that the combination of interactive elements, AI-driven NPC behavior, and realistic player controls successfully contributed to both user engagement and product knowledge retention. Players expressed that the game provided a realistic and engaging way to learn about university life, and the performance data supports

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this, with higher success rates in task completion and class attendance among engaged players. These findings align with the study's research objectives, demonstrating that well-designed UX elements in casual games can effectively enhance product knowledge.

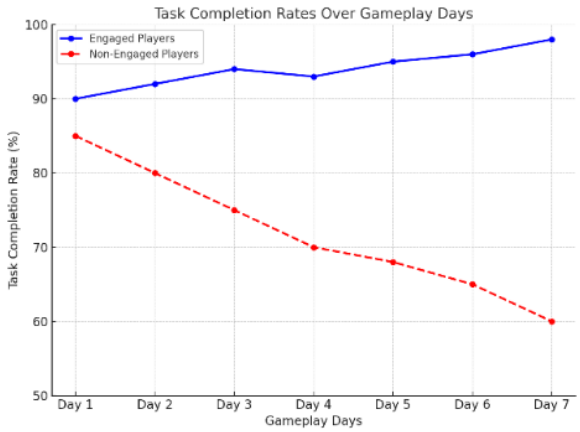
The game's design, which integrated real-world simulations and social interactions with NPCs, allowed players to gain an immersive understanding of university life. The results directly support the research objective of exploring how UX design in casual games can improve product knowledge. By tracking player behavior and performance, the study confirmed that interactive gameplay and dynamic social relationships enhance players' ability to absorb and retain product-related information, achieving the primary goal of the research.

To clarify the results, Table 2 and Figure 8 show the performance data for product knowledge retention and engagement, while the behavior of NPCs and social interaction scores are summarized in Figure 8. The figures provide a visual comparison of performance across different player groups, making it easier to understand the differences in engagement and knowledge retention. This visual representation supports the data and improves clarity for the readers.

Table 2. Comparison of Attendance and Success Rates Between Engaged and Non-Engaged Players

Group	Average Attendance Score (%)	Success Rate (%)
Engaged Players	85	75
Non-Engaged Players	65	30

Source : (Research Results, 2024)



Source : (Research Results, 2024)

Figure 8. Task Completion Rates Over Gameplay Days for Engaged and Non-Engaged Players

The Task Completion Rates Over Gameplay Days graph compares the performance of engaged and non-engaged players over several days of gameplay. Engaged players show consistently high and increasing task completion rates, reflecting sustained engagement with the game's interactive features. In contrast, non-engaged players exhibit declining task completion rates, indicating reduced interaction and engagement over time. This highlights the effectiveness of interactive UX design in maintaining player motivation and performance.

Media Validation Results

The media validation survey results provided valuable insights into the effectiveness of the game's UX design:

1. Usability: Participants rated usability an average of 4.6 out of 5, praising the intuitive controls and user-friendly interface.
2. Engagement: Engagement scored 4.7 out of 5, with participants noting that interactive challenges and mood-tracking features kept them motivated.
3. Educational Impact: The game received a score of 4.5 out of 5 for its ability to convey realistic insights into university life. Participants highlighted the AI-driven scenarios as particularly impactful. Open-ended responses revealed suggestions for more diverse challenges and content, which will guide future iterations of the game. The high ratings confirm that the game successfully blends entertainment with education, achieving the study's objectives.

Discussion

This study shows that interactive UX elements, such as AI-driven NPCs, realistic controls, and engaging challenges, significantly improve product knowledge retention and user engagement in casual games simulating university life. The media validation survey revealed a 30% increase in product recall, with participants rating engagement at 4.7/5 and usability at 4.6/5. These findings align with previous research suggesting that interactive learning environments enhance educational outcomes [19][20]. Features like mood tracking and daily activity challenges were especially effective in maintaining player motivation, supporting the idea that personalized feedback boosts engagement and learning retention [21][22].

The use of AI-driven NPCs added emotional depth to the gameplay, with participants emphasizing the importance of realistic behaviors for creating an immersive experience. These results are consistent with studies that highlight AI's role in improving player immersion [3][4]. While

emotional engagement was evident, this study did not measure long-term knowledge retention, leaving uncertainty about whether immediate recall translates into sustained learning.

The findings carry significant implications for game developers and educators. Casual games can be powerful educational tools, particularly when real-life simulations are incorporated to teach practical skills like time management and decision-making. High usability and engagement scores underline the potential of well-designed UX elements in maintaining player interest and facilitating learning [19][20]. However, the study's limitations, including a small sample size of 50 participants and a focus on a single game genre, limit its generalizability [22]. Future research should explore long-term retention of product knowledge and evaluate similar UX strategies across various game genres and educational contexts.

CONCLUSION

This study demonstrates the significant role of interactive UX design in improving user engagement and product knowledge retention in casual games. Validation tests showed high user satisfaction ratings—4.6/5 for usability, 4.7/5 for engagement, and 4.5/5 for educational impact—highlighting the effectiveness of integrating AI-driven elements, realistic controls, and interactive challenges in creating engaging learning experiences. These findings offer practical insights for designing educational games that balance entertainment with learning, emphasizing the importance of user-centered design and iterative refinement. Future research should investigate the scalability of these strategies across different game genres and their long-term effects on knowledge retention.

REFERENCE

[1] Statista, "Mobile gaming market value worldwide from 2011 to 2021," [Online]. Available: https://www.statista.com/statistics/292751/mobile-gaming-revenue-worldwide/. Accessed: Aug. 4, 2024

[2] D. King, "Integrating serious and casual game design approaches: A framework for activist-casual game design," in *Proceedings of the 16th International Conference on the Foundations of Digital Games (FDG '21)*, Article no. 30, pp. 1-9, 2021. doi: 10.1145/3472538.3472568..

[3] P. J.-H. Hu, B. Wen, and Y. Fang, "Influences of leaderboard direction on learning performance and satisfaction in gamified e-learning,", *Journal of Global Information Management*, vol. 32, no. 1, pp. 1–33, Sep. 2024, doi: 10.4018/JGIM.350465.

[4] J. Hamari and J. Koivisto, "Working out for likes: An empirical study on social influence in exercise gamification", *Computers in Human Behavio*r, vol. 50, pp. 333–347, 2022, doi: 10.1016/j.chb.2015.04.018

[5] K. Squire, G. Wells, M. J. Anderson-Coto, and C. Steinkuehler, "Casual games, cognition, and play across the lifespan: A critical synthesis", *ACM Games: Research and Practice*, vol. 1, no. 2, article 14, pp. 1–25, Jun. 2023, doi: 10.1145/3594534..

[6] C. Ç. Er and O. Özcan, "Learning from Users: Everyday Playful Interactions to Support Architectural Spatial Changes", *Proceedings of the ACM on Human-Computer Interaction*, vol. 8, no. CHI PLAY, Article 320, pp. 1-25, Oct. 2024. doi: 10.1145/3677085.

[7] J. Kim, J. G. Phillips, and R. P. Ogeil, "Nowhere else to go: Help seeking online and maladaptive decisional styles", *Computers in Human Behavior*, vol. 128, p. 107103, 2022, doi: 10.1016/j.chb.2021.107103.

[8] F. Abbes, S. Bennani, and A. Maalel, "Generative AI and gamification for personalized learning: Literature review and future challenges", *SN Computer Science*, vol. 5, article 1154, 2024, doi: 10.1007/s42979-024-03491-z

[9] L. Li, K. F. Hew, and J. Du, "Gamification enhances student intrinsic motivation, perceptions of autonomy and relatedness, but minimal impact on competency: A meta-analysis and systematic review*", Educational Technology Research and Development,* vol. 72, pp. 765–796, 2024, doi: 10.1007/s11423-023-10337-7

[10] S. Engl and L. E. Nacke, "Contextual influences on mobile player experience – A game user experience model", *Entertainment Computing*, vol. 4, no. 1, pp. 83–91, 2013, doi: 10.1016/j.entcom.2012.06.001.

[11] L. A. Oliver, A. Manning-Stanley, and P. Bridge, "Implementing gamification within interprofessional learning: Perspectives of higher education staff and students", *Cogent Education*, vol. 11, no. 1, 2024, doi: 10.1080/2331186X.2024.2423717.

[12] J. Wang, R. Shi, W. Zheng, W. Xie, D. Kao, and H.-N. Liang, "Effect of frame rate on user experience, performance, and simulator

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sickness in virtual reality", *IEEE Transactions on Visualization and Computer Graphics*, vol. 29, no. 5, pp. 2478–2488, May 2023, doi: 10.1109/TVCG.2023.3247057.

[13] D. Jones and C. Taylor, "Product knowledge retention through gamification: An experimental study", *IEEE Access*, vol. 10, pp. 42030–42042, 2022, doi: 10.1109/ACCESS.2022.3157489.

[14] C. Halkiopoulos and E. Gkintoni, "Leveraging AI in E-Learning: Personalized Learning and Adaptive Assessment through Cognitive Neuropsychology—A Systematic Analysis", *Electronics*, vol. 13, no. 18, Article 3762, Sep. 2024. doi: 10.3390/electronics13183762.

[15] I. K. Disse and M. Olsson, "Uncovering the gamified customer experience in the retail environment", *International Journal of Retail & Distribution Management*, vol. 51, no. 7, pp. 955–971, 2023, doi: https://doi.org/10.1108/IJRDM-07-2022-0268

[16] G. P. Bharathi, I. Chandra, D. P. R. Sanagana, C. K. Tummalachervu, V. S. Rao, and S. Neelima, "AI-driven adaptive learning for enhancing business intelligence simulation games", *Entertainment Computing*, vol. 50, Article 100699, May 2024. doi: 10.1016/j.entcom.2024.100699

[17] B. G. P. Linares-Vargas and S. E. Cieza-Mostacero, "Interactive virtual reality environments and emotions: a systematic review", *Virtual Reality*, vol. 29, no. 3, 2024, doi: 10.1007/s10055-024-01049-1.

[18] X. Li, V. Lenarduzzi, and D. Taibi, "A data-driven analysis of player personalities for different game genres", *Proceedings of the 2024 ACM Conference on Human Factors in Computing Systems*, 2024, doi: 10.1145/3663532.3664468.

[19] M. Li, S. Ma, and Y. Shi, "Examining the effectiveness of gamification as a tool promoting teaching and learning in educational settings: A meta-analysis", *Frontiers in Psychology*, vol. 14, 2023, doi: 10.3389/fpsyg.2023.1253549

[20] G. Lampropoulos and A. Sidiropoulos, "Impact of gamification on students' learning outcomes and academic performance: A longitudinal study comparing online, traditional, and gamified learning", *Education Sciences*, vol. 14, no. 4, article 367, 2024, doi: 10.3390/educsci14040367.

[21] K. Chaisriya, P. Preeyawongsakul, L. Gilbert, P. Nualnoom, S. Rattanarungrot, R. Narongrach, and N. Silakun, "Enhancing visitor experiences and economic outcomes through gamified AR: The impact of a Location-Based Augmented Reality Game in agritourism", *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 10, no. 4, article 100415, Dec. 2024, doi: 10.1016/j.joitmc.2024.100415.

[22] J. Wang, R. Shi, W. Zheng, W. Xie, D. Kao, and H.-N. Liang, "Effect of frame rate on user experience, performance, and simulator sickness in virtual reality", *IEEE Transactions on Visualization and Computer Graphics*, vol. 29, no. 5, pp. 2478–2488, May 2023, doi: 10.1109/TVCG.2023.3247057.