3D BALL EDUCATIONAL GAME DEVELOPMENT:
BALL PARADISE

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ABSTRACT

The increasing interest in ball sports among individuals highlights the need for an effective educational tool to help users understand and learn various ball sports. This study aims to address this need by designing an interface and interaction model using a user-centered design method. The primary objectives are to help users gain a deeper understanding of the ball sports they wish to learn and to provide a clearer comprehension of the rules. The methodology involves utilizing various software tools: Photoshop for designing the user interface, 3ds Max for creating 3D models, Unity for integrating and developing the game, and Visual Studio with C# for coding. Users log into their accounts to access the main interface, a 3D map displaying houses representing different ball sports. Users navigate the NPC to select the ball sport they are interested in, triggering the learning interface, which presents the gameplay and rules through text and 3D model animation. The project goals are threefold: establishing a user login system, creating an interactive interface for ball sport selection, and developing a learning interface to educate users through text and 3D animations. The conclusion demonstrates that this approach effectively enhances users' knowledge and understanding of various ball sports, providing a comprehensive and engaging learning experience.

INTRODUCTION

As time goes by, ball sports have attracted more and more people's interest. People not only regard it as a way of leisure and entertainment, but also as an important means to enhance physical fitness and cultivate team spirit. However, many people often feel confused and at a loss when they first learn ball sports due to the lack of systematic learning resources and practice opportunities. Therefore, there is an urgent need for an effective educational tool to help users deeply understand and learn the rules and skills of various ball sports.

Ball Paradise is an innovative educational sports game designed to provide users with a comprehensive learning experience for various ball sports. This technical report outlines the

development process, key components, and technological aspects of Ball Paradise. By leveraging modern design tools and software, the platform integrates detailed 3D modeling, interactive gameplay, and robust functionality to create an engaging and educational environment for users.

The development of Ball Paradise involved the use of 3ds Max for creating detailed 3D models of game scenes, Unity for game development, and Visual Studio for writing C# scripts. The user interface was designed using Photoshop, covering all aspects from login and registration screens to in-game interfaces.

Throughout the development process, various challenges were encountered and resolved, contributing to the platform's robustness. This report provides a detailed analysis of these challenges and the solutions implemented, offering insights into the technical intricacies involved in creating Ball Paradise.

Ultimately, this technical report aims to provide a comprehensive overview of Ball Paradise's development, from initial design concepts to final implementation, ensuring a thorough understanding of the platform's capabilities and feature

In developing Ball Paradise, significant inspiration was drawn from existing mobile applications such as KEEP and Antistress. KEEP, a widely-used fitness app, offers a comprehensive platform for users to track their workouts, follow training plans, and access a variety of exercise tutorials. Its user-friendly interface and interactive features greatly influenced the design of Ball Paradise, particularly in terms of creating an engaging and accessible user experience. By incorporating similar elements, Ball Paradise aims to provide users with a seamless way to learn and practice various ball sports, ensuring that they can easily navigate through different sections of the app and access relevant information and tutorials.

Antistress, on the other hand, provided valuable insights into the importance of interactive and immersive elements in an educational app. This app features a collection of stress-relief activities that leverage tactile interactions and visual feedback to create a calming experience for users. The incorporation of 3D models and animations in Ball Paradise was inspired by Antistress, aiming to enhance user engagement and facilitate a deeper understanding of ball sports. By presenting the rules and techniques of different sports through interactive 3D animations, Ball Paradise not only educates but also entertains, making the learning process more enjoyable and effective.

These references to existing applications underscore the importance of user-centered design and interactive features in educational tools. By analyzing the strengths and successful strategies of KEEP and Antistress, Ball Paradise integrates these elements to create a robust platform that caters to the needs of users seeking to learn and master various ball sports. This literature review highlights the foundational concepts that guided the development of Ball Paradise, ensuring that it is both innovative and effective in achieving its educational objectives.

RESERCH METHODOLOGY

The methodology employed in the development of Ball Paradise follows the Agile framework, which involves iterative development and continuous testing throughout the software development lifecycle. This methodology was chosen for its dynamic process that allows for changes even late in the development cycle. Agile is particularly suitable for this project as it requires a flexible and user-oriented approach to game development. By adopting the Agile methodology for Ball Paradise, a high-quality final product can be achieved.

Sequence diagrams play a vital role in depicting the behavior of a system. Figure 1.1 presents the sequence diagram of the Ball Paradise program, showing the running mode and execution sequence of the objects in the Ball Paradise program in a clear and intuitive way. This sequence diagram vividly demonstrates the interaction and information transfer between various components in the Ball Paradise project, providing solid support for the efficient development of Ball Paradise applications. Through this diagram, we can have an in-depth understanding of the dynamic execution process of the Ball Paradise system, providing a clear visual guide for the development team, and further promoting the optimization and excellent performance of the Ball Paradise application.
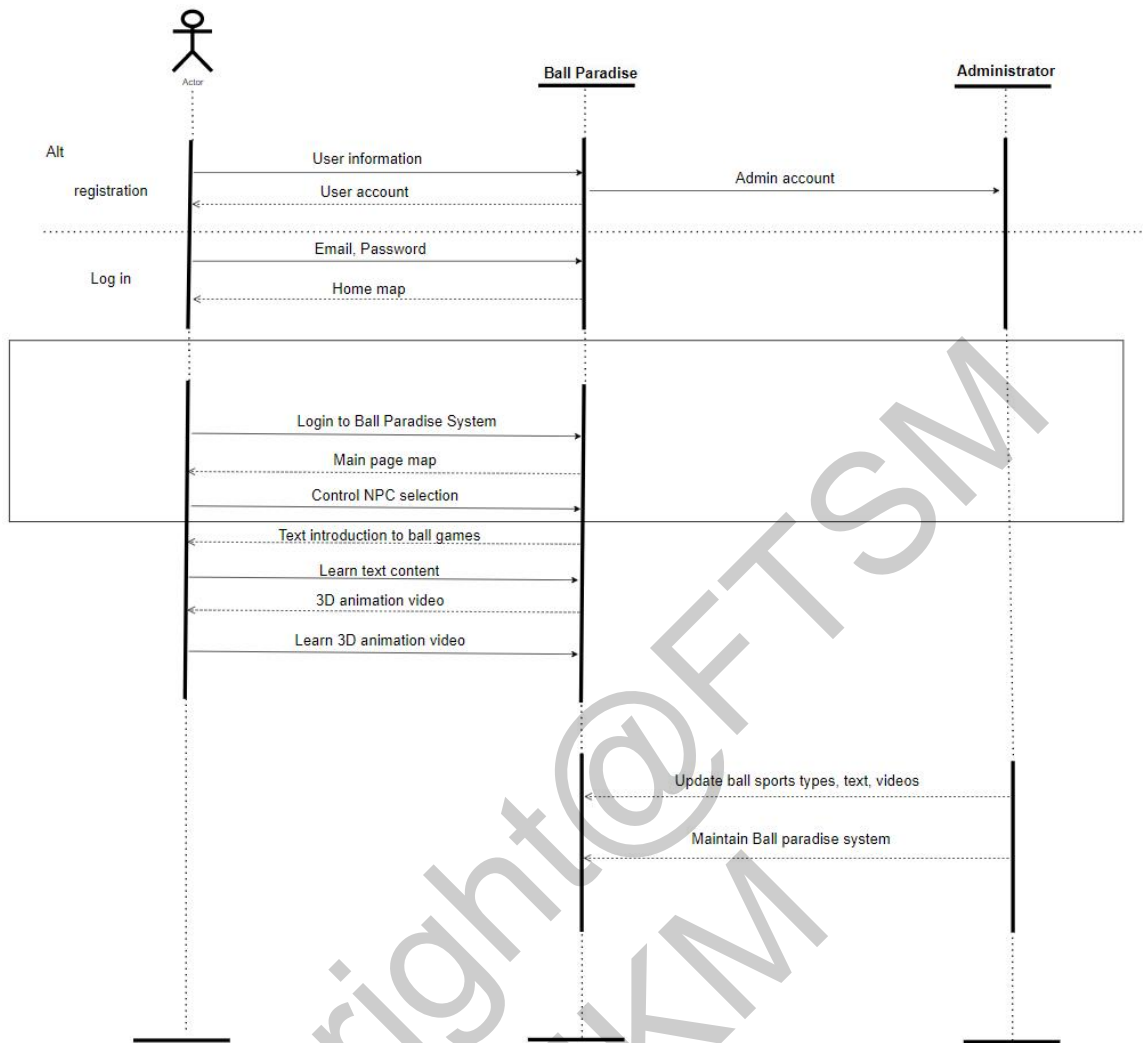
Figure 1.1 Sequence diagram of Ball Paradise

User interface design

This phase focuses on designing the user interface using Photoshop. All interfaces are designed during this phase, including login, registration, and game interfaces. This phase is also conducted to ensure that the designed interface meets the user experience requirements and the overall goals of the game. Existing game interfaces are also analyzed to increase understanding of these design elements and user interactions.

Figure 1.2 Ball Paradise login function interface design

Figure 1.3 Ball Paradise register function interface design
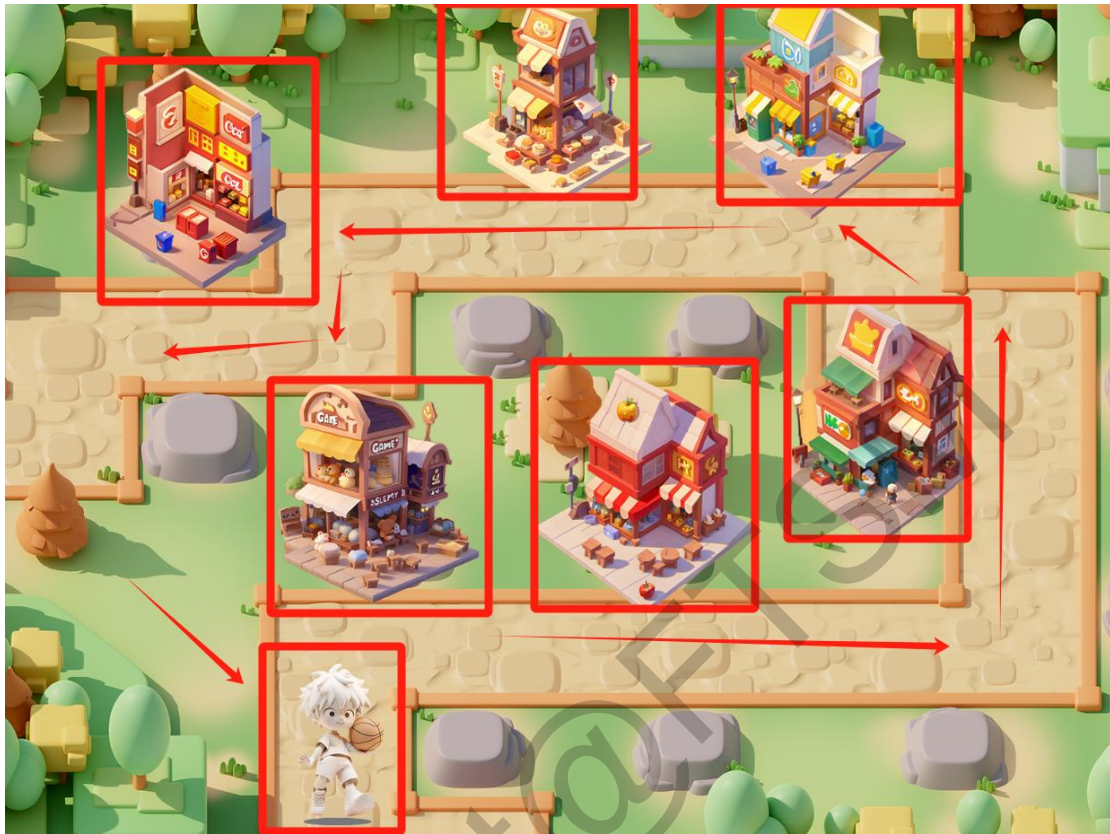
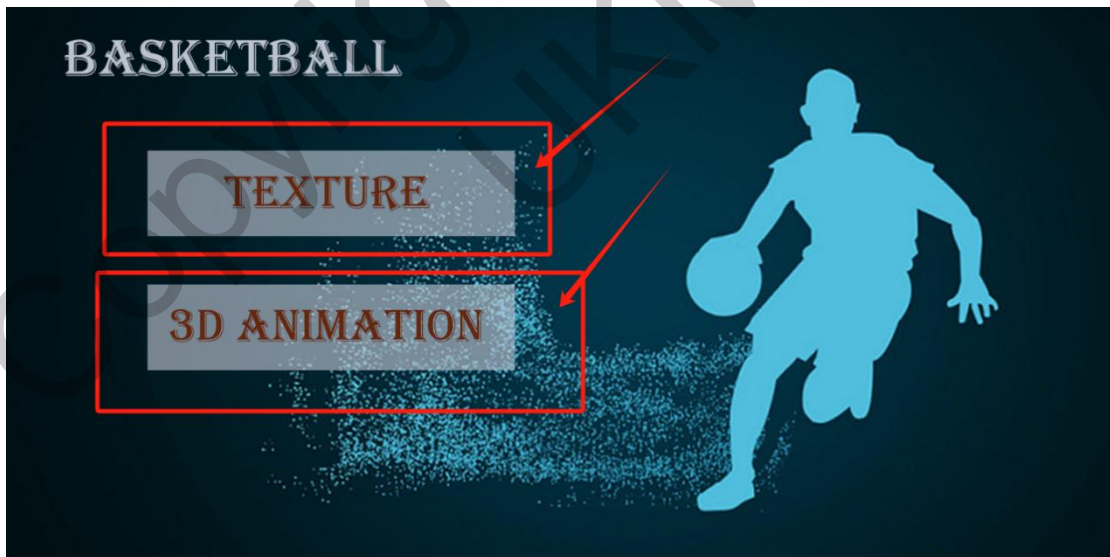Figure 1.4 Ball Paradise main page design

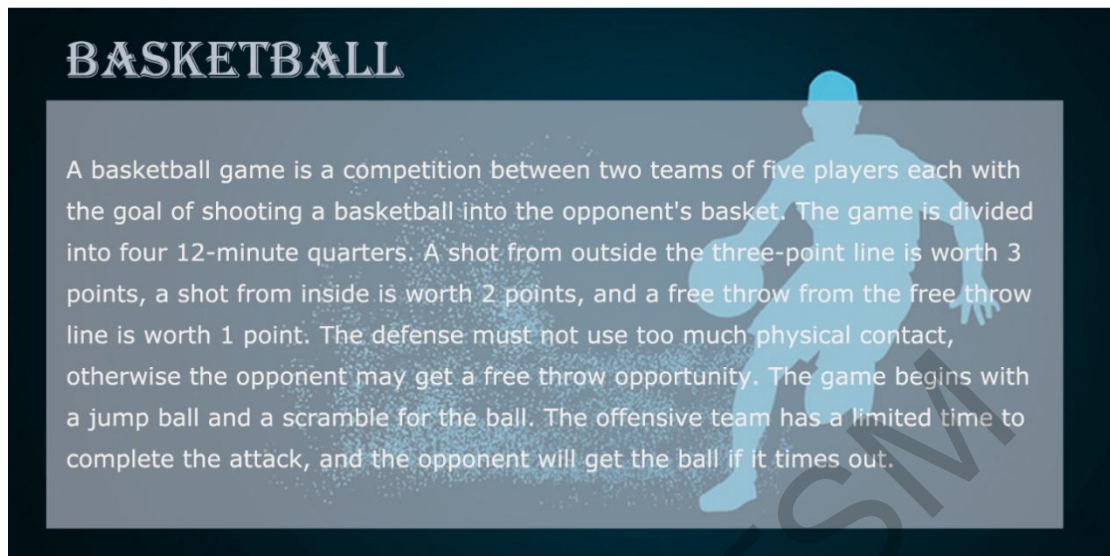Figure 1.5 Ball Paradise learning interface design

Figure 1.6 Ball Paradise texture learning interface design

Figure 1.7 Ball Paradise 3d animation learning interface design

3D Modeling with Autodesk 3ds Max

This phase focuses on modeling using 3ds Max. At this stage, all game scenes and building models are designed and finalized by individuals. This phase is also conducted to ensure that the designed models meet the overall goals and visual effects of the game. In addition, the modeling of existing games is studied to increase the understanding of these design elements and 3D modeling techniques.

Figure 1.8 3D Model of Ball Paradise Wireframe

Figure 1.9 3D Model of Ball Paradise

Integration with Unity

This phase focuses on integrated development using Unity. During this phase, all game elements and features are designed by individuals and integrated into Unity. This phase is also conducted to ensure that the developed game achieves the established goals and functions. In addition, the development of existing games is studied to increase understanding of these design elements and Unity development techniques.

Figure 1.10 Unity 3d Ball Paradise game scene

Figure 1.11 Player Characters

Programming Phase

This phase focuses on writing C# code using Visual Studio. At this stage, all game logic and functionality are written and implemented by individuals using the C# language. This phase is also conducted to ensure that the developed game achieves the established goals and functions. In addition, the development of existing games is studied to increase understanding of these programming techniques and design patterns.

Testing Phases

This phase focuses on system testing and debugging. During this phase, individuals conduct comprehensive testing on the Ball Paradise game to ensure that all functions are functioning properly. Potential errors and issues are identified and fixed through unit testing, integration

testing, and user testing. This phase is conducted to ensure that the developed game is of high quality and stability and can provide a good user experience. In addition, feedback and iterative optimization are used to further improve the game's functions and performance.

RESULTS AND DISCUSSION

This is the login interface of Ball Paradise, which aims to provide a simple and intuitive user experience. Users can easily log in to their accounts through this interface to start their journey of learning and exploring the world of ball sports. The interface design is simple and clear, including registration and login options.
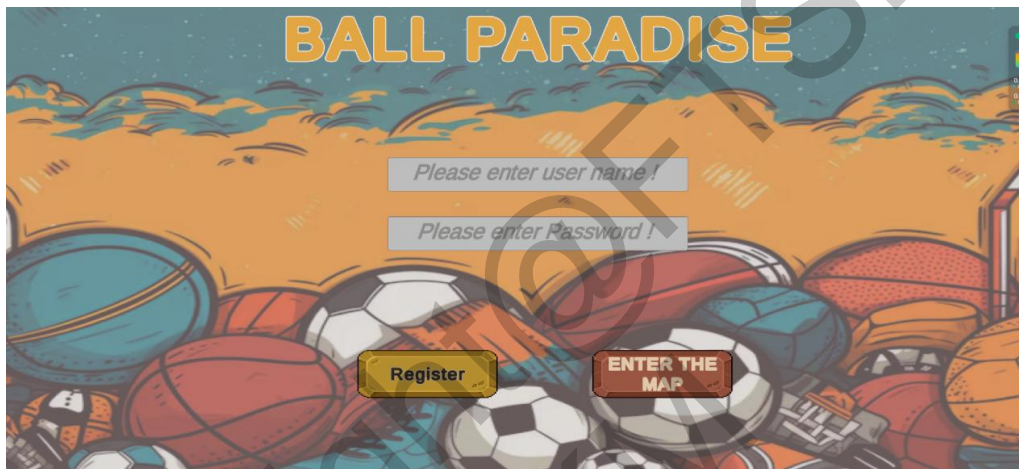

Figure 1.12 Login interface

This is the registration interface of Ball Paradise, which is designed to be simple and intuitive. Users can fill in the necessary information to create their game account. The interface provides user-friendly navigation and input fields to ensure that the registration process is simple and smooth, allowing users to quickly access the various features and resources of the game.
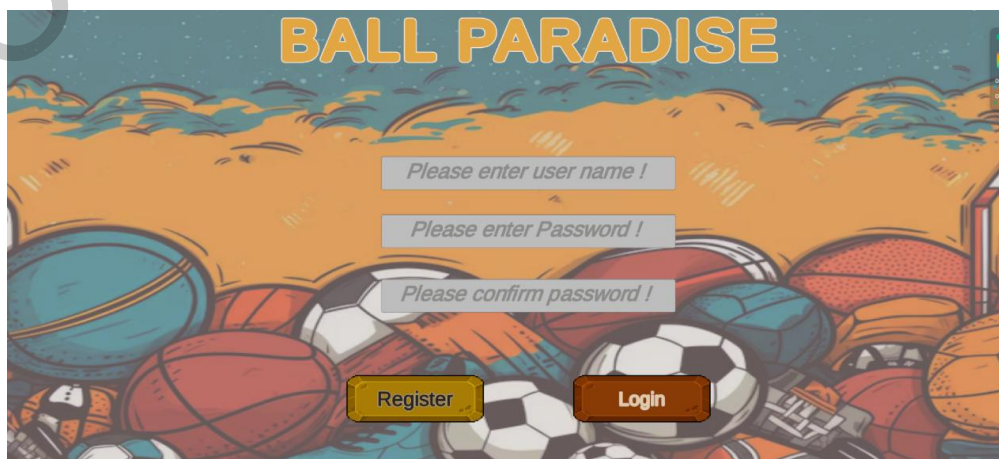

Figure 1.13 Register interface

Figure 1.14 Operation Guide

This is the game interface of Ball Paradise, which is simple and intuitive. Users can select different ball sports learning areas through interactive 3D maps. Each area has a detailed learning interface, which displays the rules and skills of ball sports through text and 3D animation to help users learn and practice in depth.

Figure 1.15 Ball Paradise game scene

The following uses bowling as an example. The other ball games have similar learning functions as bowling.
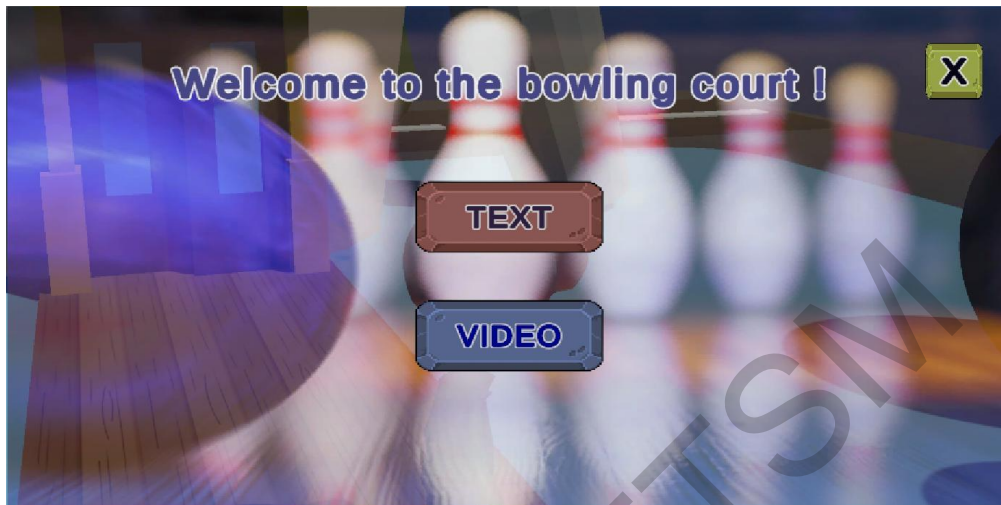

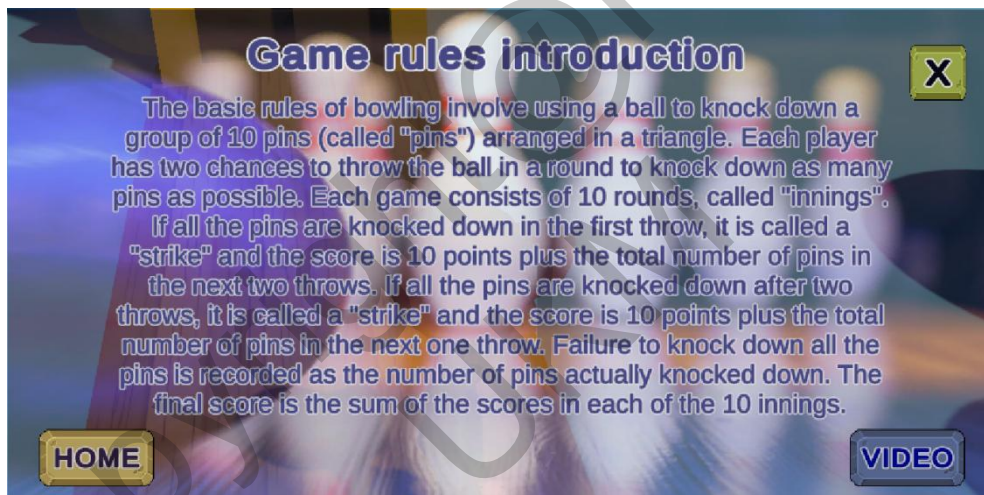Figure 1.16 Bowling learning interface

Figure 1.17 Bowling text learning interface

Figure 1.18 Bowling video learning interface

User feedback shows that Ball Paradise successfully combines education and entertainment, with the interface design and learning content presented in an intuitive and interesting way.

How effective has Ball Paradise been in helping you learn and improve your skills in ball games?
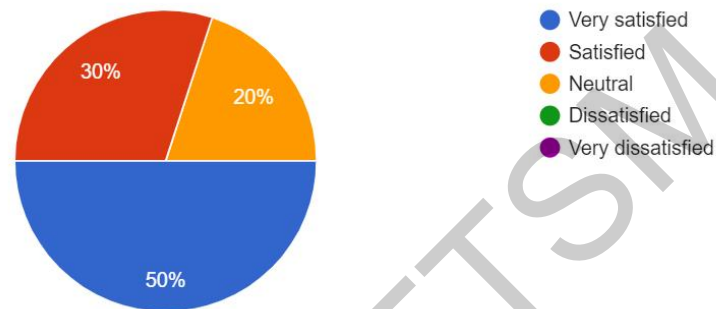
10 responses

Figure 1.19 Ball Paradise User Survey Evaluation

CONCLUSION

Ball Paradise is an innovative educational sports game that aims to help users learn and master the rules and skills of multiple ball sports through a virtual 3D environment. The game is designed with a focus on user experience, using an intuitive interface and interactive learning methods to enable users to participate in the learning process in a more in-depth and interesting way.

In terms of technical implementation, the game's interface design and visual effects are carefully crafted using Photoshop tools to ensure the beauty and consistency of the user interface. Detailed 3D model modeling and scene design, including precise texture and lighting effects, were performed using 3ds Max to enhance the visual realism and immersion of the game environment.

The core development of the game is based on the Unity engine and C# language, which enables the development team to implement complex interactive functions and dynamic special effects, providing users with a smooth and responsive gaming experience. From the registration and login function to the implementation of the game exploration and learning

interface, each part has been carefully designed and tested to ensure the stability and reliability of the overall system.

The positive feedback from users proves the success of Ball Paradise in combining education and entertainment. The game not only improves users' understanding and skills in ball sports, but also brings them a pleasant and fulfilling learning experience. In the future, Ball Paradise will continue to optimize and expand to further meet users' learning needs and enhance the functionality and attractiveness of the game.

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REFERENCE

Zheng, Y. *3D Course Teaching Based on Educational Game Development Theory – Case Study of Game Design Course.* International Journal of Emerging Technologies in Learning (iJET), 14(02), pp. 54–68. 2019. https://doi.org/10.3991/ijet.v14i02.9985

Yusny R. and Fitri S., *The Influence of Digital Games Based Learning on Students' Learning Outcomes and Motivation.*Register Journal, vol. 6, no. 2, pp. 77-100, 2013. DOI: https://doi.org/10.18326/rgt.v6i2.77-100

Kyong.J.K., *Online MBA students' perceptions of online learning: Benefits, challenges, and suggestions. Register Journal, vol. 8 , no. 4, pp. 335-344 , 2005. DOI : https://doi.org/10.1016/j.iheduc.2005.09.005*

Arab World English Journal (AWEJ) Special Issue on CALL Number 9. July 2023 Pp.105-121 DOI: *https://dx.doi.org/10.24093/awej/call9.7* *(Station Rotation with Gamification Approach to Increase Students' Engagement in Learning English Online)*

Musa, N. N., & Fojkar, M. D. (2019). Correlation between students' english listening skills, vocabulary skills and out-of-school listening exposure. New Educational Review, 55(1), 42–53. DOI : *https://doi.org/10.15804/tner.2019.55.1.03*

Asia-Pacific Journal of Information Technology and Multimedia Jurnal Teknologi Maklumat dan Multimedia Asia-Pasifik Vol. 11 No. 2 December 2022: 40 - 48 e-ISSN: 2289-2192. DOI : *https://doi.org/10.17576/apjitm-2022-1102-03*

Wang, A. I., & Lieberoth, A. (2016). *The effect of points and audio on concentration, engagement, enjoyment, learning, motivation, and classroom dynamics using Kahoot.* In Proceedings from the 10th European Conference on Games Based Learning, (p. 738). Reading, UK: Academic Conferences International Limited.

Abidin, S. R. Z., Noor, S. F. M., & Ashaari, N. S. (2019). *Low-fidelity prototype design for serious game for slow-reading students. International Journal of Advanced Computer Science and Application*, 10(3), 270-276. DOI: *https://doi.org/10.14569/IJACSA.2019.0100335*

Auzar, A. (2012). Keberkesanan penggunaan perisian asas membaca [Effectiveness of using basic reading software]. *GEMA OnlineTM Journal of Language Studies*, 12(2), 629-644.

Hyungsup Y (2014) *A study on an analysis of success factors of a serious game: in case of ''Anti-Aging Village''* International Journal of Multimedia and Ubiquitious Engineering 9:205–214 DOI : *http://dx.doi.org/10.14257/ijmue.2014.9.7.17*

Mortara M, Catalano CE, Bellotti F, Fiucci G, Houry-Panchetti M, Petridis P (2014) *Learning cultural heritage by serious games. Journal of Cultural Heritage* 15:318–325

Sacfung A, Sookhanaphibarn K, Choensawat W (2014) *Serious game for fire safety evacuation plan*. Adv Mater Res 931–932:583–587.10.4028. DOI : *http://www.scientific.net/AMR.931- 932.583*

Wiemeyer J (2010) *Serious Games—The challenges for computer science in sport International Journal of Computer Science in Sport* 9:65–74

Werner Siegfried Ravyse ,2017, Vol. 21 Issue 1, p31-58. 28p. DOI : *10.1007/s10055-016-0298-4*

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