

The Digital Game for Curriculum Public Relations (PR) and Learning Using Unity3D

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Abstract—In the age of digital disruption, universities and educational institutions all over the world provide many bachelor's, postgraduate, and non-degree curricula. Information is mostly presented in different forms, i.e., public relations (PR) on websites, mobile applications, or social media; including field PR at different sites, e.g., department stores and schools. However, the limitations and the problems are that the presented information fails to attract or motivate the perception, interest, and participation of the target groups. Also, traditional PR requires resources in terms of persons, time, and many expenditures. Thus, this research aimed to present the development of a game to present information for PR of bachelor's curriculums using Unity3D, which could reduce the limitation of presentation or PR in traditional forms. It could also save the PR budget and could be done anywhere and anytime.

Keywords—digital game, Unity3D, public relations (PR), e-learning

1 Introduction

Countries worldwide currently adjust their instructional patterns as online and on-site [1-3] to support changing situations in terms of digital disruption and the situation of the COVID-19 outbreak [4-5]. Many curriculums of each educational institution are provided, both degree and non-degree curriculums [6-7], resulting in relatively high competition. The solutions of having a few students that educational institutions use include curriculum PR outside or at high schools, PR through online or social media, e.g., YouTube, Facebook, and TikTok; including content presentation on websites using texts and images. However, PR using these methods still contains some limitations, i.e., lack of participation of target groups, failure of presented content to attract a target audience, a mismatch between PR time and leisure time of target groups, failure of presented details to attract target groups, or the difficulty to make difference. Fortunately, current information and communication advancement reveals technologies that can be used in curriculum PR and in instructional management for students.

According to the literature review and related research, it was found that technologies are used to develop instructional media for learning and for participatory learning (PL), i.e., augmented reality (AR) [8-10], 3D animation [11], games [12] and active

learning [13-15]. The study results revealed that AR, 3D animation, and games could better attract students to lessons, resulting in the accomplishment of objectives to develop students, with better achievements. And according to the literature review and related research, it was found that game development is presented for sports marketing PR in consumers [16]. However, most are used as VDO presentations whereas players play games, particularly free online games [17-19]. Based on extensive literature reviews and related research on the utilization of games in PR, it has been discovered that the presentation of information in alternative games, without specifically designing a game for direct information dissemination, poses certain limitations. This ultimately leads to an inconsistency between the presentation of information and the intended target audience. It is to increase PR channels to reach more target groups. However, according to the literature review and related research, the development of digital games for bachelor's and postgraduate curriculum PR has not been found yet. Furthermore, the objective of this research is to create a prototype game that effectively presents information and promotes educational curricula to the target audience. The aim is to enhance the presentation of information in an engaging manner, enabling players to actively participate and interact with the developed games. This research highlights the development of a digital game using Unity3D and C# for curriculum PR with the goal of effectively communicating curriculum information to the target groups. The primary focus is to enhance the target audience's perception and engagement with the contents, aiming for improved attraction and interest. Additionally, the game provides round-the-clock access to the contents, allowing users to engage with them at any time.

2 Related works

This research encompasses a comprehensive review of relevant literature, focusing on four key research topics: game development for instructional purposes, Game development utilizing Unity, the Adaptive Gamification Framework, and game development for PR communication. The following provides a detailed breakdown of each topic.

2.1 Game development for instructional purposes

According to the literature review and related research on game development for instruction and PR communication, it was found that most games are developed to create instructional media in different courses at elementary [20-21], high school [22-23], and higher education levels [24-25]. They are also used for measurement and evaluation process in each particular course, i.e., the development of pretest and post-test games [26-27] by various forms of game development and presentation, i.e., game development using online platforms through web applications and mobile applications like Wordwall [28], Kahoot [29], and Genially [30]; game development using software, e.g., Unity3D [31-36] and Unreal Engine [37-38]. According to the previous literature review and related research, Unity3D is used for game development and comparison of development capability with other software, e.g., Unreal Engine, Square Half-Life2,

and Gamebryo-Oblivion. Related studies reveal that Unity3D is prominent for its simplicity to be used by developers and its availability of low-cost and free versions [31]. This conforms to the presented comparison between Unity and Unreal Engine for game development to simulate a visit to antiques in a museum. Different resources were compared to test the development time used for the development. The results revealed that Unity took less time for development in terms of Central Processing Unit (CPU), Graphics Processing Unit (GPU), and Random Access Memory (RAM) with different speeds and sizes. Besides, it was also found that computers used in the development did not need high efficiency [32]. Based on the literature reviews and related research, it has been identified that utilizing game development software like Unity offers the advantage of developing games on demand rather than relying on online platforms. Hence, this research adopts the use of game development software.

2.2 Game development utilizing Unity

In the realm of game development using Unity, it has been discovered that Unity3D serves as a platform for enhancing microcontroller learning skills and stimulating student interest, thereby fostering their inclination for self-study [33]. Furthermore, there have been instances of game design and development employing Unity3D and Autodesk 3D Max, with instructional materials provided. The content is presented in a manner where students are encouraged to engage with the games by reading and answering questions. Consequently, students exhibit more enjoyment and interest compared to traditional content presentations in instructional management that do not incorporate games [34]. Additionally, there is a noteworthy suggestion for utilizing game development to enhance learning in postgraduate engineering studies, particularly in the era of COVID-19 and Industry 4.0, where physical attendance may be inconvenient or undesirable for individuals. In this context, game development utilizing Unity3D is proposed to present content relating to sensor component associations, thereby facilitating interested individuals in acquiring knowledge relevant to their work [35]. This aligns with the application of game development for health purposes, as exemplified by neurogaming development utilizing Unity, Emotiv EPOC, and Neuro Headset. The resulting game can be employed for health promotion and surveillance, serving as a fundamental tool to support healthcare initiatives [36]. Moreover, Unity is widely employed in the development of 2D and 3D games across various research areas. Studies have shown that utilizing Unity for game development yields efficient games with quick response times. Furthermore, learning and development processes are expedited, requiring less time investment [34][39-41]. Unity3D was selected as the game development platform in this research based on the findings of this literature review.

2.3 Adaptive gamification framework

Through an extensive review of literature and research on the Adaptive Gamification Framework, it becomes evident that game development plays a vital role in facilitating the acquisition of cultural heritage knowledge, particularly in the context of developing

open-source software. This framework serves as an effective template for creating interactive e-learning lessons that encourage active participation. Moreover, it provides opportunities for students to engage in communication and friendly competition among themselves. Additionally, the framework facilitates seamless communication channels between teachers and students, fostering effective collaboration and knowledge sharing [42]. The offering includes the development of a digital platform that facilitates dynamic content management within games. This empowers teachers who wish to incorporate game-based learning by enabling them to create games without requiring prior game development expertise. Additionally, the platform allows for efficient content management and communication with students. As a result, this solution alleviates the cost constraints previously associated with relying on commercial platforms [43]. The research findings and studies have explored the integration of games in preschool and elementary school science education to foster learner engagement and participation. The aim is to develop appropriate learning management strategies and adaptive environments that captivate learners' interest, leading to enhanced learning experiences [44]. A literature review was conducted to design and develop a framework for adaptive gamification in physics learning. The review encompasses the history of gamification, the architecture of adaptive learning environments, and the implementation of a gamification prototype. The results indicate that the process can be successfully applied to game design and development for effective learning management across various disciplines [45]. Building upon the literature review, this research has implemented the process in the development of games.

2.4 Game development for PR communication

According to the related research on game development for PR or communication to target groups, it was found that most mainly rely on PR communication by content insertion to online games with many players or the popular games at that time in the form of content presentation through VDOs [17-19]. As for game development for PR, there is a concept for VR video games for advertising to replace traditional content presentation. This concept is applied to sports marketing to increase or attract consumer interest to buy sports products [16]. But when exploring PR related to educational affairs or curriculum presentation, game development has not been found for any of such use. Thus, this research presented the development of the digital game for curriculum PR using Unity3D and C# for curriculum PR communication to the target groups for their better perception and attraction to the contents.

3 Methodology

The primary aim of this research is to develop an engaging game that effectively presents information to promote an educational curriculum, allowing active participation from the target audience.

The specific objectives of our research include:

1. Developing interactive games that facilitate the promotion of educational curriculum information.
2. Utilizing open-source technology in game development to minimize costs and overcome limited resource constraints.
3. Evaluating game performance and assessing player satisfaction levels.

This research focused on the development of a game called "The Wonder land of IT" with the aim of promoting the curriculum of the Bachelor of Science in Information Technology at the Faculty of Science and Industrial Technology, Prince of Songkla University, Surat Thani Campus. The game development process involved incorporating all relevant data pertaining to the curriculum and instructional procedures. This included information on available courses, specialized lecturers, postgraduate career opportunities, registration fees, and contact details. Furthermore, the game design was based on the real university environment, featuring authentic buildings, constructions, and computer labs. The purpose was to provide supporting information about the campus environment, aiding interested individuals in making informed decisions regarding this curriculum. "The Wonder land of IT" encompassed various elements, such as the presentation of Information Technology concepts and the completion of missions at each stage. These missions involved puzzles, questions, and tasks to assess students' progression. Examples of missions included navigating to specific destinations, overcoming obstacles, searching for objects and secret codes, answering questions based on presented information, interacting with non-player characters (NPCs), and collecting coins to accumulate scores.

During the system analysis and design phase of this research, it was determined that the primary users of the game were individuals who had an interest in participating in the game as well as those who were interested in the curriculum itself. The analysis and design process showcased the functionalities of the developed game through a use case diagram, as depicted in Figure 1. The diagram illustrated that players had the ability to engage with various features and actions within the game. The internal functions of the game included parameter settings, such as volume and mouse sensitivity adjustments, as well as communication with NPCs to receive missions at each stage. Players could also access information about the curriculum, control their character, navigate through the game world, collect coins, search for clues or guidance, view their score, and input secret codes or passwords. Additionally, players had the opportunity to provide suggestions and evaluate their satisfaction with the game by utilizing a QR code integrated within the game for direct feedback to the developer. The research is limited by the fact that the developed game does not currently have support for mobile devices.

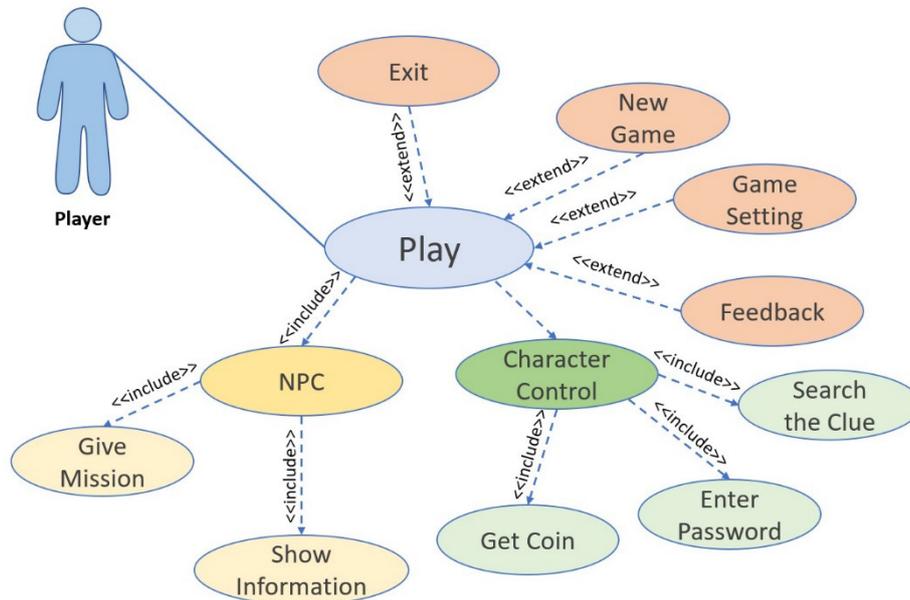


Fig. 1. Use case diagram

In this research, a workflow was designed to illustrate the activities and functional procedures of the developed game. The workflow was represented in Figure 2 using an activity diagram, which showcased the sequential activities of players throughout the game. When players initiated the game, they had the option to select the "game setting" before accessing information about the developer. Alternatively, they could proceed with the default settings. Once the game started, players would receive missions at each stage, involving tasks such as searching for clues, answers, and passwords by exploring different areas. They could also refer to presented information to answer questions. Successful completion of missions would reward players with coins, contributing to their overall score. The game progressed in a circular manner from the first stage to the final stage. If players decided to stop playing, they could exit the game. However, if they were unable to complete all the missions within a session, the last paused scene would be saved so that they could resume from where they left off in their next game-play session without needing to restart. To illustrate the interaction between players and different aspects of game development, a sequence diagram was utilized, as shown in Figure 3. This diagram demonstrated the various interactions players could have with the game, including volume control, accessing curriculum information, communicating with NPCs to obtain information or missions, traversing the game world to find descriptions, answers, and passwords, as well as collecting coins to achieve a higher score. In terms of the hardware and software used for game development, this research employed a combination of different tools and technologies, as outlined in detail in Table 1. The hardware and software components were categorized separately for the developer and the players.

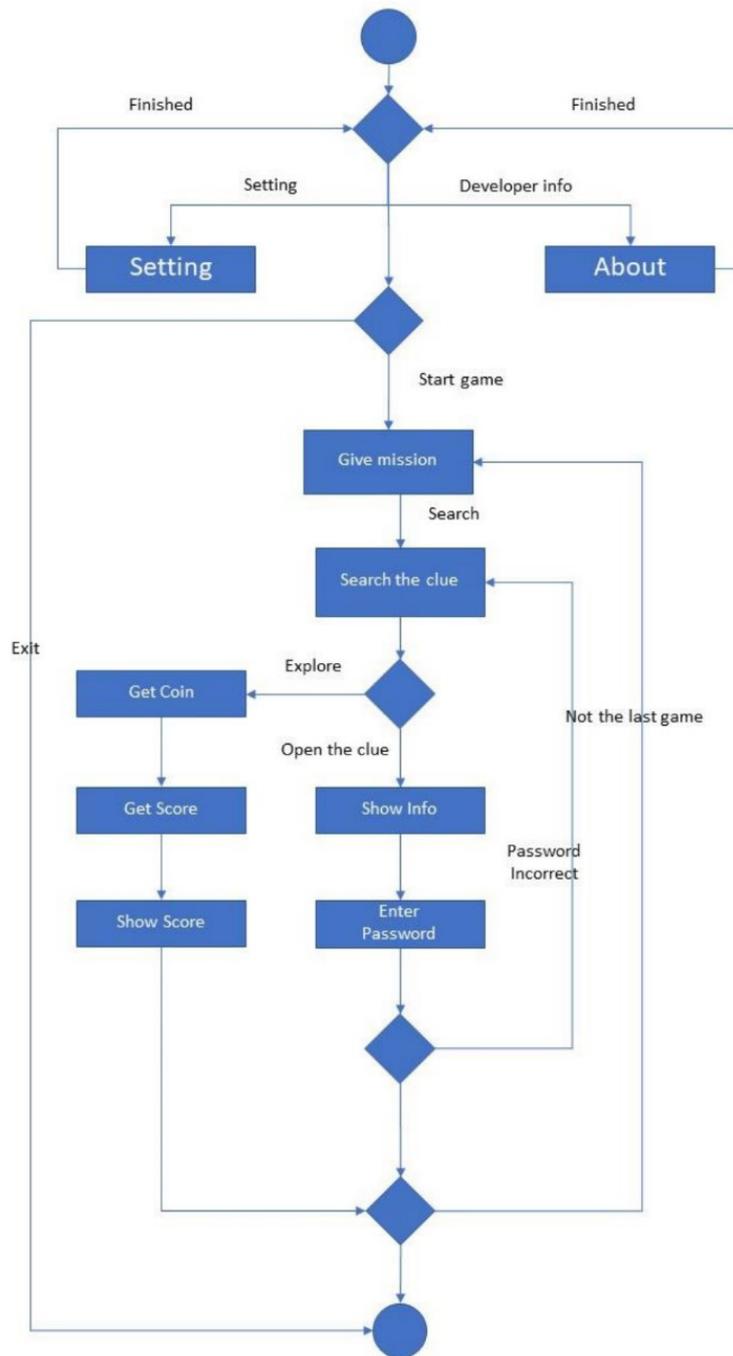


Fig. 2. Activity diagram

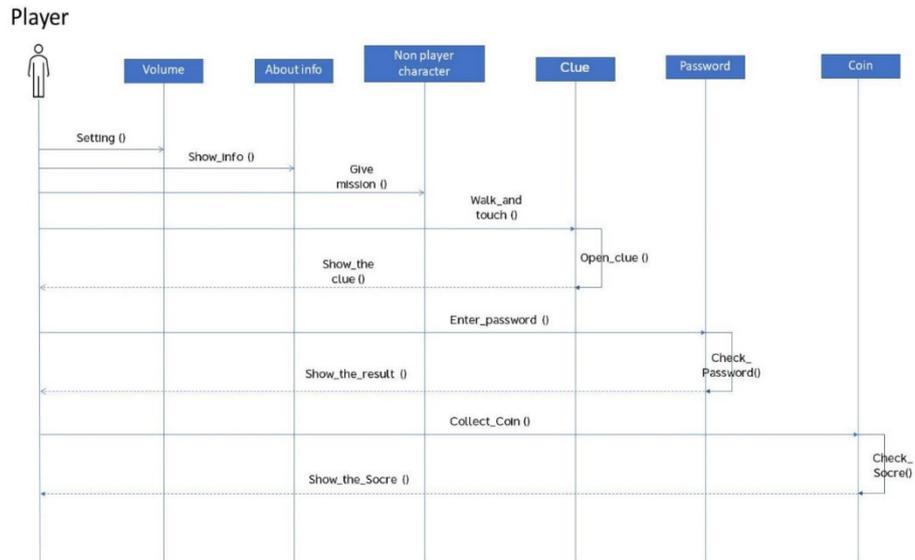


Fig. 3. Sequence diagram

Table 1. Software and hardware specificaiton

Topic	Developer	Player
Software	Microsoft Windows 11 Unity3D C# Visual Studio Code Web Browser	Microsoft Windows 10 or upper Web Browser
Hardware	Gaming Laptop RAM 16 GB Harddisk 512 GB or upper	Personal Computer/Laptop Harddisk 300 MB or upper
Internet	Broadband/Wifi/5G	4G/5G/Wifi

To assess player satisfaction with the game, participants, including both students and lecturers, were instructed to complete a questionnaire. The questionnaire was divided into three aspects: Contents and Attraction, Functionality and Performance, and Usability, as specified in Table 2.

Table 2. The evaluation criteria of satisfaction toward game development

Topic	Subtopic
Contents and attraction	Appropriate contents Interesting/attractive contents Complete contents Fun Appropriate presentation form
Functionality and performance	Quick response Only a few resources were required All functions were activated
Usability	Easy for use The design of User Experience (UX) The design of User Interface (UI) Conformity Music

4 Results

The results of this study are presented in two parts: the outcomes of the developed game "The Wonderland of IT" and the results of the satisfaction evaluation. In the first part, the findings of the developed 3D game for the bachelor's curriculum PR using Unity3D indicated that players were able to navigate the game through different menus. The game consisted of three stages, each representing a specific course category: Software Development, Data Science, and Digital Business. Figure 4 illustrates an example of the game's initial interface. The first page of the game featured buttons with various functions. The "New Game" button allowed players to start or restart the game, while the "Play" button enabled them to continue from their previous progress. The "Settings" button provided options to adjust mouse sensitivity, master volume, and music volume. The "Feedback" button allowed players to evaluate their satisfaction and provide feedback on the game, while the "Exit" button allowed them to leave the game. These buttons are depicted in Figure 5. The player interface displayed scenes with objects and supporting information presented in various formats, such as images, sound, videos, and scores. NPCs played a crucial role in the game by communicating with players, providing stage-related information (Figure 6), notifying them of missions to be completed (Figure 8), and posing questions to progress through the stages (Figure 7). Additionally, Figure 9 illustrates an example of the user interface used to pause the game, which could be accessed by pressing the ESC key on the keyboard. The game incorporated Information Technology-related content in different forms, including videos (Figure 10) and textual information accompanied by images (Figure 11). These examples showcased detailed course information, lecturer specializations, and postgraduate career options.

Presenting information through the game could attract the target groups more because they could participate and interact through the game. As a result, they enjoyed and paid attention to viewing the contents answering questions and completing the mission of each stage. For the score, when players walked to collect coins, their score would increase, as in Figure 12. The figure shows that from the start, the score = 0. And

when they walked to collect coins, their score would increase by the number of collected coins.



Fig. 4. Main interface of the wonderland of IT game



Fig. 5. Feedback and satisfaction interface



Fig. 6. NPCs for communication with player's example



Fig. 7. Question example in the wonderland of IT game

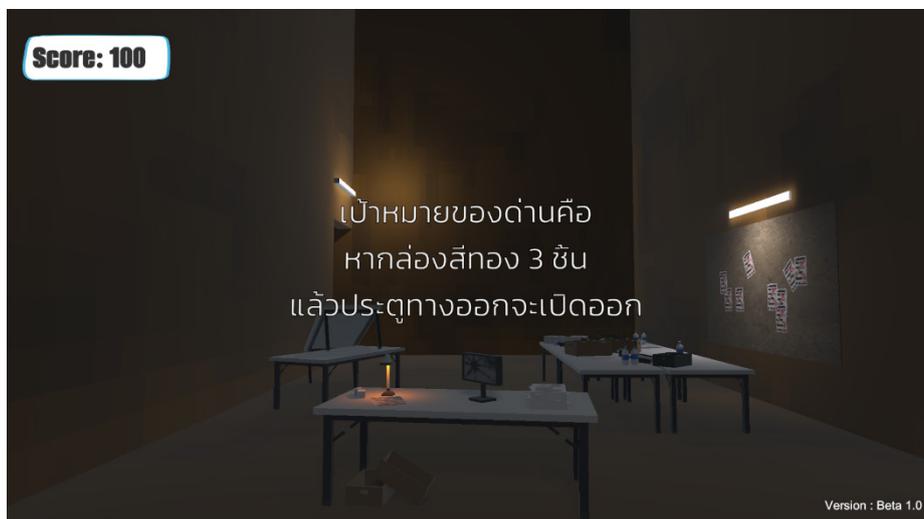


Fig. 8. Notification of missions in game



Fig. 9. The example of user interface used to pause the game



Fig. 10. Examples of content presented in video form



Fig. 11. Examples of content presented in images form

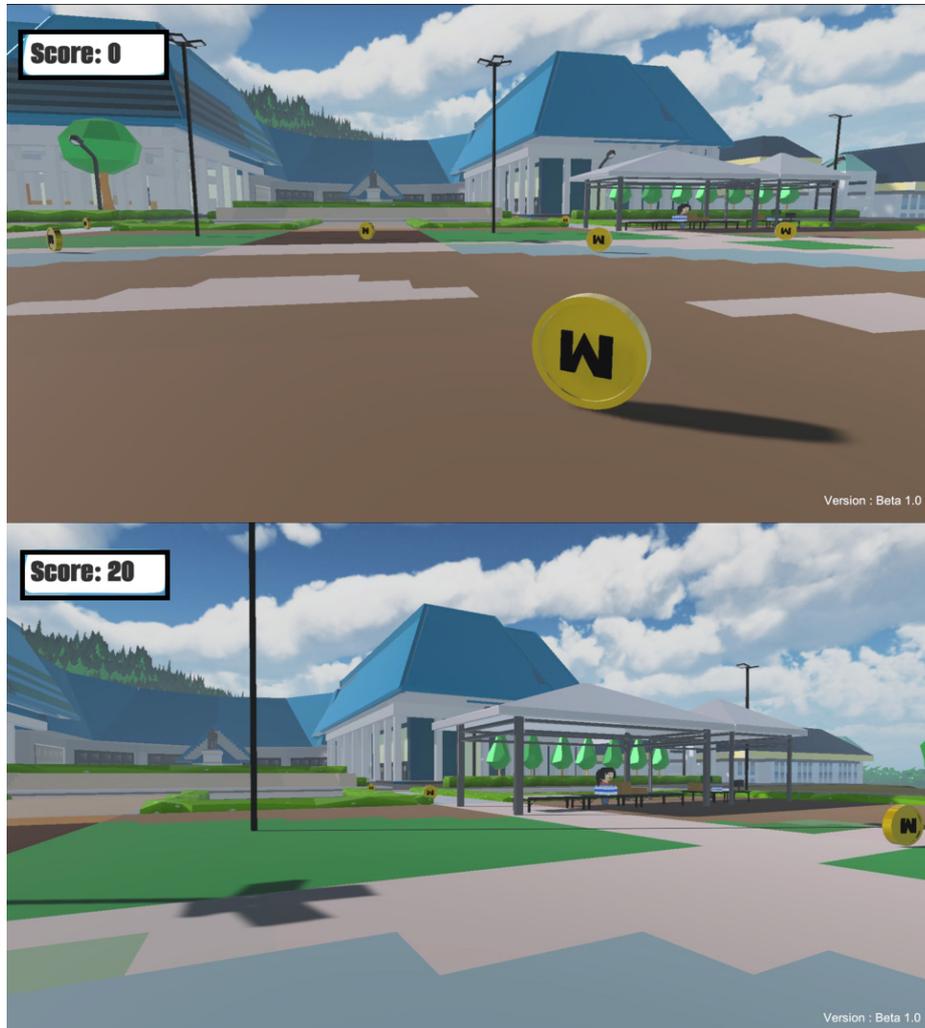


Fig. 12. In-game score interface example

For satisfaction evaluation in 20 players, i.e., students and lecturers using the questionnaire that included 3 aspects, i.e., contents and attraction, functionality and performance, and usability. It was found that the evaluation results in all 3 aspects were excellent, with the mean and SD in each aspect, i.e., contents and attraction ($\bar{x} = 4.73$, $SD = 0.44$), functionality and performance ($\bar{x} = 4.70$, $SD = 0.45$), and usability ($\bar{x} = 4.73$, $SD = 0.47$); as per the details in Table 3. For the suggestions of game development according to satisfaction evaluation, the game should be developed to be applicable on mobile devices, e.g., smartphones and tablets; and should support the installation in Android and IOS.

Table 3. The satisfaction evaluation results

Topic	Subtopic	Mean	SD.
Contents and attraction	Appropriate contents	4.75	0.44
	Interesting/attractive contents	4.70	0.47
	Complete contents	4.75	0.44
	Fun	4.60	0.50
	Appropriate presentation form	4.85	0.37
Mean		4.73	0.44
Functionality and performance	Quick response	4.75	0.44
	Only a few resources were required	4.45	0.60
	All functions were activated	4.90	0.31
Mean		4.70	0.45
Usability	Easy for use	4.75	0.44
	The design of User Experience (UX)	4.70	0.47
	The design of User Interface (UI)	4.80	0.41
	Conformity	4.70	0.47
	Music	4.70	0.57
Mean		4.73	0.47

5 Discussion

In the previous section, game development was introduced to present educational curriculum information, providing players with the opportunity to actively engage and interact with the game. The research objective, as well as the key features and capabilities of the game, were discussed. Furthermore, an evaluation of the game's performance was presented to assess its effectiveness.

According to the results of the development of “The Wonder land of IT” for Information Technology PR using Unity3D and C#, it was found that the game could reduce the limitation of PR content presentation in the traditional forms that lacked the participation of the target groups and failure to attract an audience. The game could motivate players to be more interested and pay attention to accessing presented information. And according to the results of technical development, it was found that Unity3D used in the development contained several prominences, i.e., no need for high-spec hardware, compact file, and quick response time of the developed game. These conformed to previous research on Unity3D for game development to promote learning in different aspects [31-35].

The research presented aligns with the principles of game development in the context of cultural heritage learning, allowing players to interact and engage with games, which in turn enhances the effectiveness of learning [42]. Furthermore, it corresponds to research that focuses on the development of digital platforms for creating games, with the aim of using game development as an educational model and a means of presenting information. This approach facilitates quick and direct access to content, enabling players to learn and retrieve information efficiently [43]. Additionally, it is in accordance with the findings of a literature review that proposes a framework for designing and developing physics learning games. The framework includes the proposed architecture and prototype development process, which can be applied to design and develop games

for learning management, as well as effectively disseminate various types of information [45].

Upon analyzing the differences compared to previous research, it was observed that most studies focused on developing games for instructional purposes or learning management [33-35], as well as for industries and entertainment [16][18]. In terms of PR, games were primarily used for content presentation or advertising during playing free online games [17-19]. In contrast, the game development approach employed in this research aimed to present curriculum PR information in an engaging manner. This approach not only makes the presentation more interesting but also attracts a larger number of target groups, eliminating the need for external PR efforts. Moreover, it can be effectively combined with traditional PR methods.

6 Conclusion

The objective of this research is to create a prototype game that effectively presents educational curriculum information, promoting active participation from the target audience. The research aims to address the following key questions:

How does the utilization of game development in presenting educational curriculum information impact the interest and accessibility of the target audience?

What are the advantages of presenting information through developed games in comparison to traditional methods of information presentation?

The utilization of game development in presenting curriculum PR information through Unity3D and C#, with active player participation in completing mission stages, has proven to be a more effective approach in reaching the target groups compared to previous methods. It not only fosters engagement but also enhances information retention among the target groups and interested individuals. Additionally, this form of PR enables a simpler and faster outreach to the target groups without the need for physical presence in schools, resulting in resource savings in terms of personnel, time, and expenses.

Moreover, the guidelines and insights gained from game development can be applied to other PR endeavors, particularly those targeting school-age or teenage audiences. For future research implementation, the game can be further developed and made compatible with multiple platforms and devices, allowing for a wider application and reach.

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