



Interim Report

A 3D Game to Raise Teenagers' Awareness on Cybersecurity

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Abstract

With the popularity of technology, there are more and more users start using Internet. Teenagers is a group that has the largest percentage of Internet users. However, there are lots of traps that cannot be ignored. This project is to educate teenagers about Cybersecurity through a 3D game such that they would not fall into the cyber traps. This paper included a full picture of the game. Mechanisms, storyline, game design etc. were included in this paper.

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Introduction

Internet is a crucial part of the world nowadays. There are 4.39 billion users in January 2019 [1], which is more than half of the world population. Internet allows people to communicate with others, shop online, find resources, entertain, and do many other things. Although it is convenient and useful, it brings risks. People may be aware of some large scale incidents including leakage of clients' data of Faster Payment System, Cathay Pacific or TransUnion [2]. However, they seldom notice those small scale or personal data breach.

% of U.S. adults who use the internet, by age

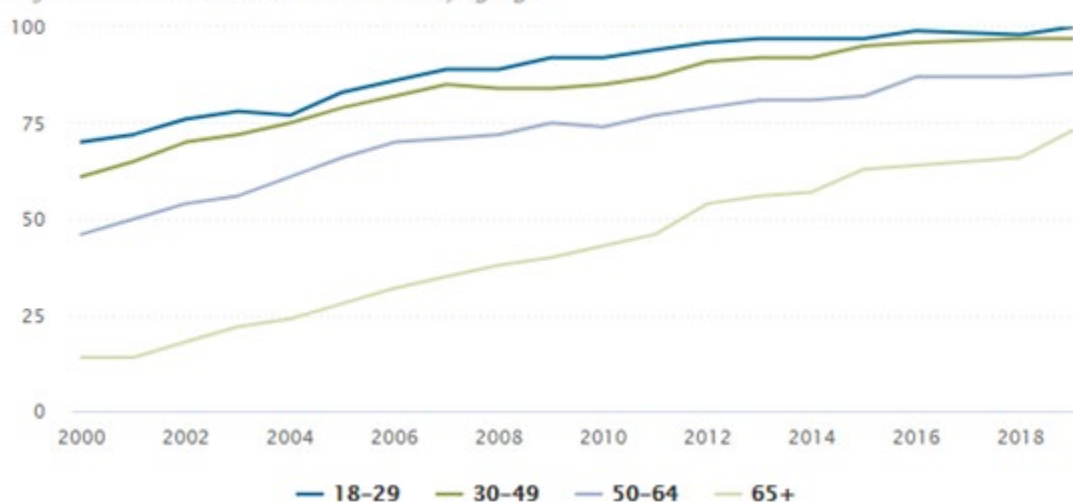


Figure 1. Internet use by age in United States [3]

As shown in Figure 1, the number of internet users increases when the age goes down. In 2018, the internet users in age group 18-29 reached 100%. It is believed that the percentage of teenage Internet users would be as high as age group 18-29.

A report provided by Pew Research Center shows that 90% of teenagers play video games [4]. It shows that video games are attractive towards teenagers.

It is proved that playing games is an effective way to learn [5]. There is a need of educating people towards cybersecurity. As most of the teenagers are Internet users, it is certain that the effectiveness of targeting teenagers would be greater than that of other age groups.

This project raises the awareness of teenagers towards cybersecurity through games as teenagers love playing games. It is believed that teenagers can learn a lot of knowledge towards cybersecurity through this game. Then the teenagers can use the knowledge to stay away from cyber crimes and prevent cyber crimes before it happens.

The following of the project plan would first state the current situation regarding cybersecurity games. Next, it would discuss the main message we would like to include in the game. Then, it would suggest a way to explain cybersecurity in the game for easy understanding. Finally, it would show project schedule with status.

Background

There are several results when searching for cybersecurity games. The following will discuss two of them as examples.



Figure 2. Screenshot of "Targeted attacks: the game" [6]

Figure 2 is a screenshot from the game "Targeted attacks: the game" where players' action is needed for the first time. Players act as the CIO of a company in the game. The game requires players to watch movies to understand the scenarios, then make choices to proceed. Different choices have different cost and risk. These will affect upcoming story. The game talks about cybersecurity at business level. Real people participate in the movies to give a sense of reality. The game targets working people and is not suitable for teenagers learning. Players can only watch, read and select in the game. This kind of playing experience is probably not attractive to players.

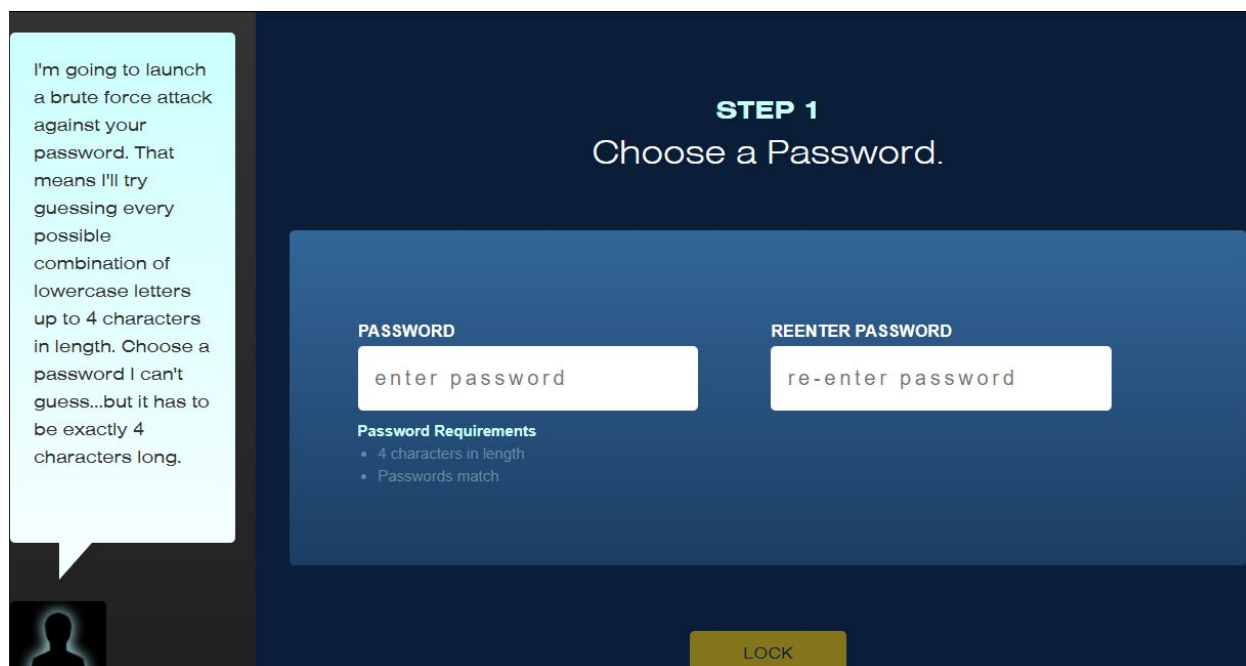


Figure 3. Password Cracking Challenge of “Cybersecurity Lab” [7]

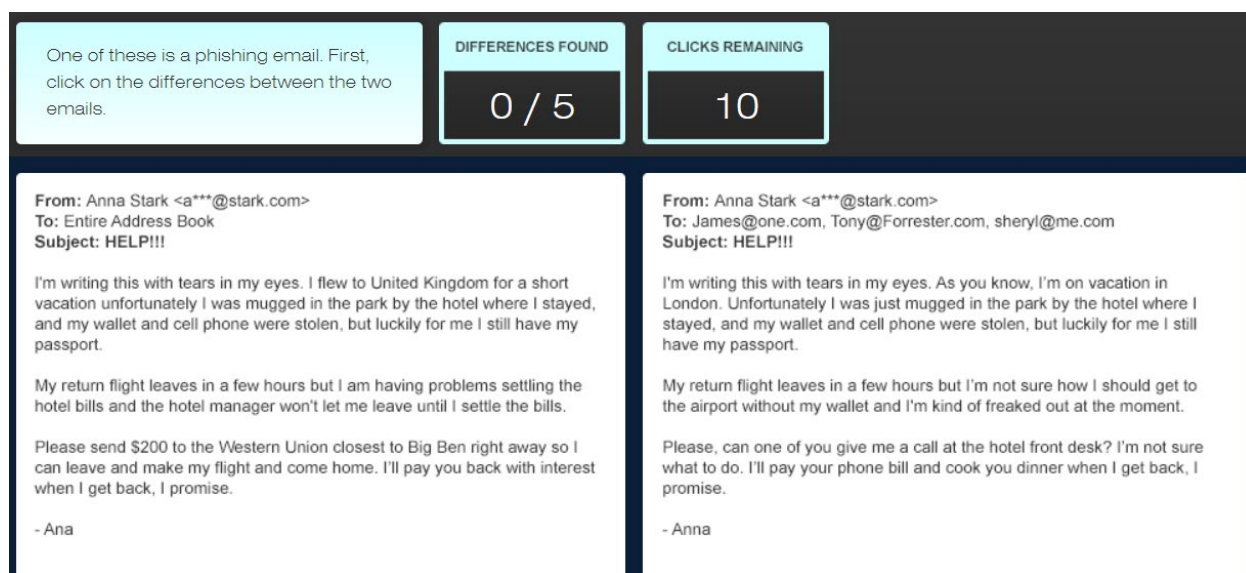


Figure 4. Social Engineering Challenge of “Cybersecurity Lab” [7]

Figure 3 is level 1 of the password cracking challenge in the game “Cybersecurity Lab. The person in black on the left side is opponent who gives instructions. Players have to select their own password to prevent opponent from guessing it. Then, players select a way to guess opponent’s password.

Figure 4 is level 1 of the social engineering challenge in the game “Cybersecurity Lab”. In the challenge, players need to click on differences or simply identify suspicious places. Then, make a decision on which is the phishing one.

This game is talks about cybersecurity at personal level. The instructions are clear and everyone should be able to finish it with ease. However, it may be too easy. Teenagers may get bored and quit the game before finishing it.

The above examples indicate some drawbacks of existing games. To alleviate such drawbacks, this project aims at developing a game that can deliver cybersecurity knowledge while providing sufficient challenges as incentive to finish the game. It is hoped that the game can be attractive to both learners and players to widely deliver the knowledge.

Objectives

Most of cyberattacks need users to take action before they can successfully obtain information. It is hoped that a workable game is delivered while it can raise players' awareness on these kinds of attacks and take precautions to avoid falling into those traps.

Target Audience

Although everyone should learn about cybersecurity, adults are likely to have much knowledge than teenagers due to job training or experience. The target audiences are teenagers. The game will be in English for PC platform due to time and experience constraints.

Scope of the work

Cybersecurity is a wide topic. There are different types of attacks targeting specific person, general public, companies, governments and other kinds of target. There are measures to provide protection, prevention or avoidance. This project aims to help teenagers to use the Internet safely. Therefore, the focus is attacks on specific person or public, and measures applicable by individuals. Others attacks and measures will be included as collectibles in the game as references for those interested.

Mechanics

Player's targets are to complete missions by obtaining passwords, successful hacking or other means. By password techniques, players can guess the password by reading target profile. For other cases, they may need to get into target's home or office and look for notes or clues. They can also try to crack the password by programs testing combinations of specific characters. Hacking would be represented by mini games. One way is talking to target represented by dialogue and options.

Story of the game

The player will act as a new hacker in the game. The hacker is living in a city called "Toon City" and receive different jobs by emails. There will be a rival who is also a hacker. The target of the hacker is finding out who that rival is.

Playing of the game

The player is free to move in the city. The player can interact with some of the people or enter a building. When the person or building is related to the main storyline. There will be a "!" marked on top of corresponding person or building. The story may require the player to win in a mini-game which will be introduced in later stage. The player can also find some collectibles which hiding in the city. The story or collectibles will unlock different threats in dictionary. After finishing a chapter of the story and a quiz provided in the dictionary, the player will get a skill point to upgrade their skills which can be used in different mini-games to gain some advantages.

Mini-games

Randomness

In order to provide more enjoyment to the users, some randomness will be added to the games' environment or targets' actions that player's experience will be different every time. With randomness adding variety to the game, the player is not able to use the same way to clear the stage every time and following a simple guideline without thinking.

Mini-game 1 - Hacking

The player is required to enter the correct password of someone' computer in public areas e.g. library. Player need to find clues of the password by looking at the surrounding to see if any memos left. If the player fails to enter the correct password in a specific time, the owner of the computer will come back and the player will be

caught. If the player fails to enter the correct password in a limited number of times, the computer will be locked automatically and fail.

There will be specific number of memos every game. However, the memos will be put in different places randomly while loading the game. The player may not be able to find all the memos in the same places every game.

Mini-game 2 - Breaching Firewall

The player is required to breach the target's firewall and install malwares into the computer. A random map will be loaded while loading the game. There are multiple paths that the player can reach target's computer but there are some patrol robots. Player has to reach the goal without being discovered by the robots in a limited time. Otherwise the firewall will detect this invalid connection and block all the available paths.

While loading the map, the map will be cut into 4 parts equally. For each part of it, a small map will be loaded randomly and form a complete map. A patrol robot will be set in each of the small map and the area of patrolling is limited into that small map only for each robot.

Mini-game 3 - Social Engineering

The player is required to guess the password of a person after communicating with that person. There will be multiple options available for player to choose every time. Each option will carry a score that player doesn't know how much it carries. After the communication, player will be given clues about the password based on how many scores the player got. The player has to guess the password successfully in a limited time and number of times. If the score of the player is lower than a specific value during communication, the person will know that the player is trying to steal his password and go away and mission failed.

Skills Available & Level Up

There are 3 kinds of techniques available in the game. Player would get ability point when leveling up and could upgrade techniques in one of the streams. Player may fail to obtain information and cause target's awareness. This may lead to mission failure. All three streams of techniques can be used to complete mission.

1. Longer time

There will be more time for the player to play the mini-game. By upgrading this skill, more time will be given in every game.

2. More chances

The player has more chances to guess the password. One more chance will be given by upgrading a specific level of this skill.

3. Hint

The player can use hint once every game. By upgrading this skill, the hint will be more and more specific.

Game Engine

In order to create a game, there are two popular game engines, Unity and Unreal.

Unity is the most popular game engine in the world now. Unreal can provide a higher quality of graphics than that of Unity in terms of upper limit. Therefore, Unreal would be chosen while creating a VR (Virtual-Reality) game. However, as Unity is the most popular game engine, it provides a bigger asset store and plug-ins. Asset store provides different templates or elements for users to download. The assets are used in the creator's games. Plug-ins provides functions that Unity doesn't provide in default. Unity also easier to learn when compared with Unreal.

After some comparisons between these two game engines, Unity is more suitable in working on the project.

First, for new creators who are not going to create game with extremely high quality, Unity would be a better choice [6]. It would be better to learn Unity instead of Unreal in order to get into practice in a short period of time.

When shorten learning process is mentioned, it comes to the second point – the time limitation. This project works for around eight months. In this short period of time, the time spent on learning should be minimized.

Third, this game is not a commercial game so it is not needed to use Unreal engine that gives a high upper limit on graphics quality. Therefore, Unity will be used in this game development.

Aesthetics

The proposed usage of aesthetics is using 3D human models and environment assets. This would provide a realistic game world.



Figure 5: Modern city environment [9]



Figure 6: 3D living room [10]



Figure 7: 3D characters [11]

Figures 5, 6 and 7 are packages found for now that may be suitable for this project. Figure 5 is assets of a city. Figure 6 is assets of a living room. Figure 7 is assets of characters. Although they may fit for the project, combining them together may introduce weirdness. Since the creators of the packages are different, the styles of assets are different. Putting them into one game will cause inconsistency. The inconsistency is a tolerable issue for the purpose of the project. So, the best effort will be done to reduce inconsistency by using assets of similar style but not to eliminate it.

3D gaming

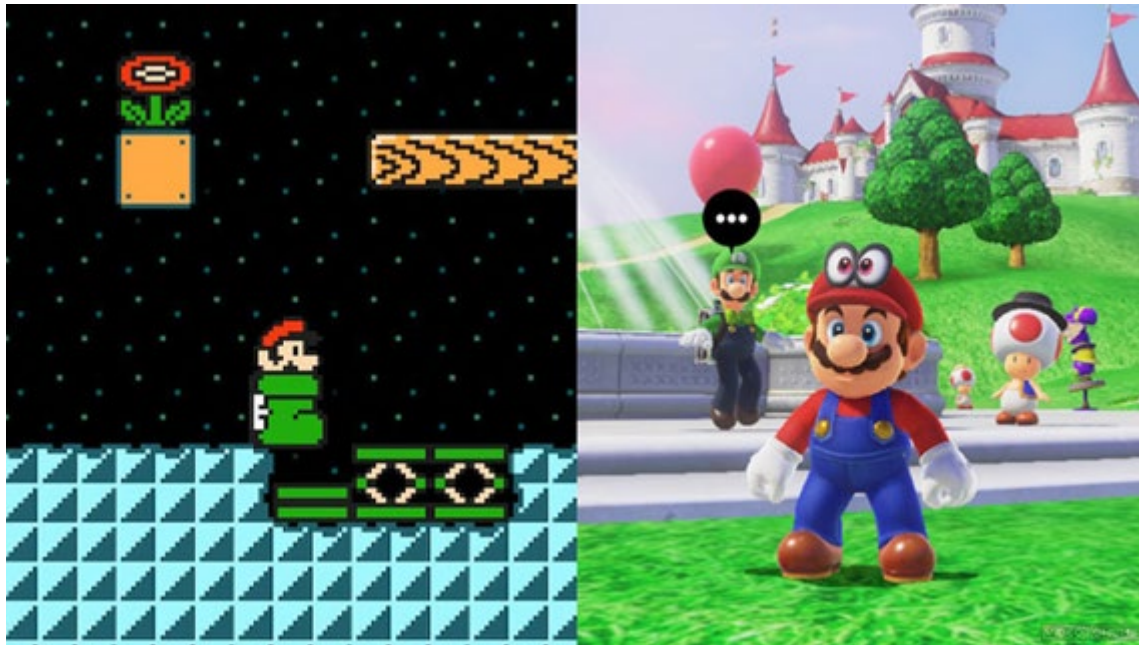


Figure 8. 2D vs 3D Mario [12]

As shown in Figure 8, there is a huge difference in visual representation. 3D Games are providing a higher quality of visual images, especially in model' details. For a 3D game, it provides more possibilities in gameplay. In control, 2D games provides simple control only while 3D games allows more complicated control options as the character in 3D game can explore in any direction.

In the project, the mini-games are designed with features that 2D games cannot achieve. For example, making use of front view, back view and side view while designing the mini-games.

User Interface

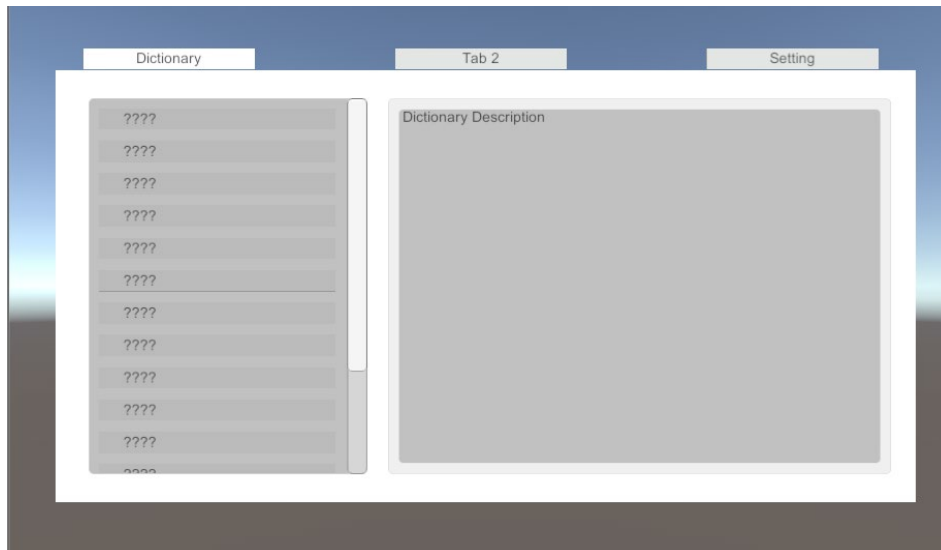


Figure 9. UI at initial status

Figure 9 shows the menu on called by escape button. The default active tab is dictionary tab. The content will be unlocked by collectibles. All contents will be locked at fresh game and show as “????”.

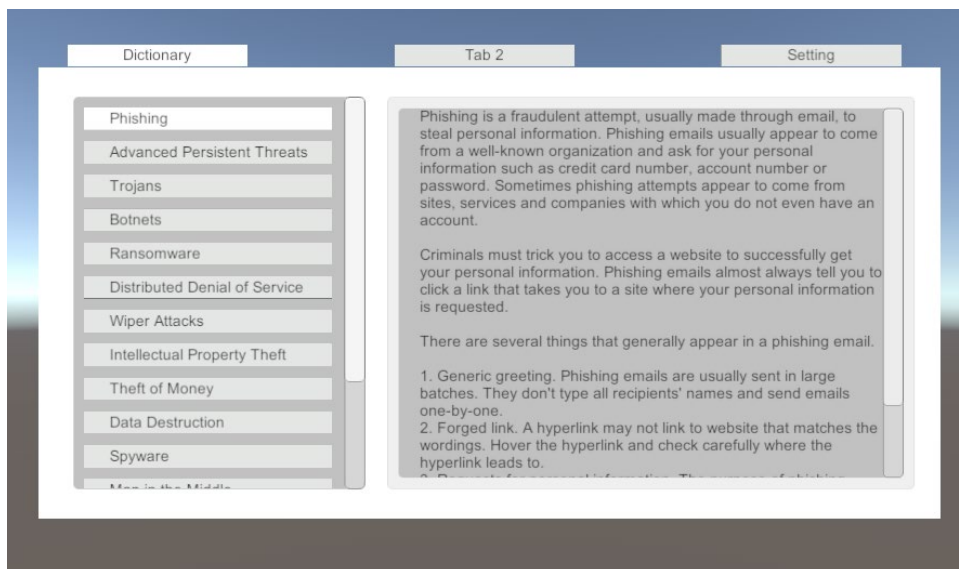


Figure 10. Unlocked Dictionary

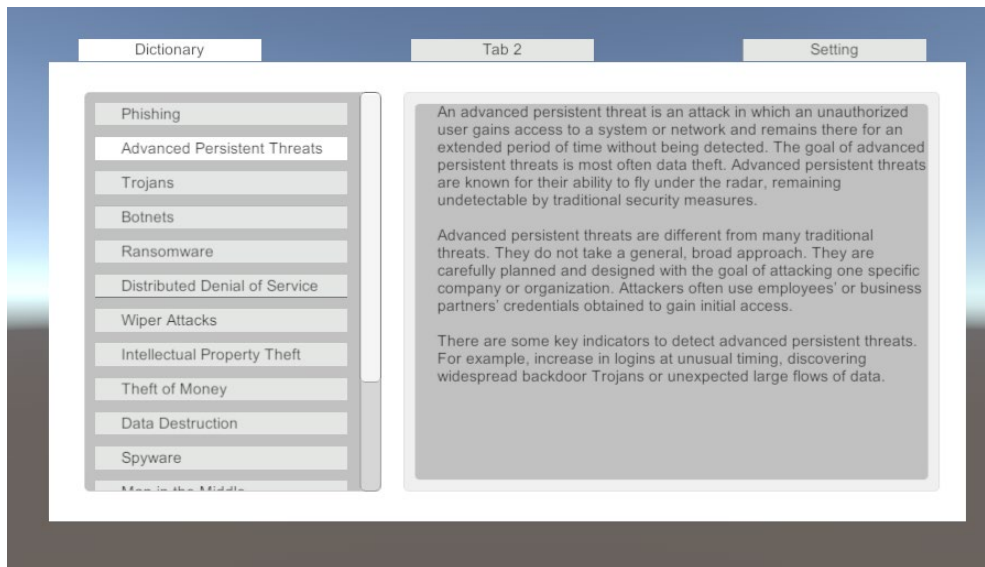


Figure 11. Dictionary details not overflow

Figure 10 shows the menu with all items in the dictionary unlocked. Left side contains selectable words. When players select any one, the right side will show the corresponding details. The right side will show the scroll bar if text overflow the visible area. Figure 11 shows a shorter details and the scrollbar will disappear automatically.

“Tab 2” would be for skill trees. Since the skill part is subject to changes during gameplay development, it is not yet confirmed and developed.

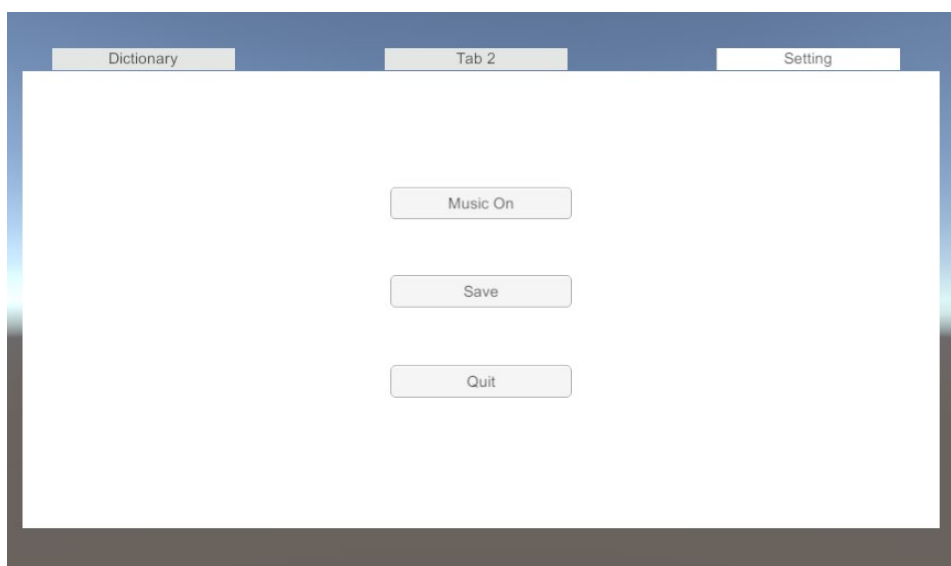


Figure 12. UI at setting tab

Figure 12 shows the visual when players click on setting tab. The first button is for turning music on or off. The current status is shown on the button. The second button is for saving progress. Although the button is working, the only variable saving is the music on/off flag. Others will be added in gameplay development. The third button is quit button. Clicking it will cause the pop up of the confirmation message. Selecting “yes” will close the application while selecting “no” will close the confirmation message.

Schedule

Date	Deliverable	Finished
29 September 2019	Project plan Project web page	✓
October 2019	Game design (mechanic, story, game flow, etc.)	✓
Early to mid November 2019	Find assets and consider the necessity of making assets on our own	✓
Mid November 2019 to December 2019	Implementation of UI system and basic mechanic	✓
January 2020 to March 2020	Implementation of game flow and subsystem	
2 February 2020	Preliminary implementation Interim report	
April 2020	Bug fixing, Fine tuning, UAT, any ad hoc work	
19 April 2020	Finalized implementation Final report	

Table 1: Project plan

Conclusion

The objective of this project is to raise teenagers' awareness on cyber security through a 3D game as it can be seen that there are more and more users joining the world of technology but they don't have much knowledge towards security.

This report proposed a game mechanic using three streams of techniques to complete missions in the game. They are three big topics in cybersecurity: hacking, breaching firewall and social engineering. It is hoped that the game is interactive and interesting for teenagers to play, while successfully involves cybersecurity message for teenagers to learn.

The next step is the start of implementation of the game. Although problems may come up during implementation of interact system, dialogue system or mission system, it is likely that the same questions were raised by previous game developers. It is highly possible to find a solution on the Unity forum. The development process should be generally smooth.

Reference

1. S. Kemp, "Digital 2019: Global Digital Overview," DataReportal, 30-Jan-2019. [Online]. Available: <https://datareportal.com/reports/digital-2019-global-digital-overview>.
2. M. Ma, "Cyber security you wouldn't credit," The Standard, 30-Nov-2018. [Online]. Available: http://www.thestandard.com.hk/sections-news_print.php?id=202787.
3. Pew Research Center, "Internet use by age," 11 Jan 2017. [Online]. Available: <https://www.pewinternet.org/chart/internet-use-by-age/>.
4. Monica Anderson and Jingjing Jiang, "Teens, Social Media & Technology 2018," 31 May 2018. [Online]. Available: <https://www.pewinternet.org/2018/05/31/teens-social-media-technology-2018/>.
5. Essays, UK, "Theories surrounding learning through play," Nov 2018. [Online]. Available: <https://www.ukessays.com/essays/young-people/theories-surrounding-learning-through-play-young-people-essay.php>.
6. Trend Micro, "Targeted Attack: The Game", Targeted Attack: The Game, 2019. [Online]. Available: <http://targetedattacks.trendmicro.com/cyoa/en/>. [Accessed: 01- Dec- 2019].
7. WGBH Educational Foundation, "Cyber Lab | NOVA Labs | PBS", Pbs.org, 2019. [Online]. Available: <https://www.pbs.org/wgbh/nova/labs/lab/cyber/research>.
8. R. Lee, "Is Unity easier than Unreal?," 2 Oct 2017. [Online]. Available: <https://www.quora.com/Is-Unity-easier-than-Unreal>.
9. Unity Technologies, "Modern City Environment", Unity Asset Store, 2019. [Online]. Available: <https://assetstore.unity.com/detail/3d/environments/urban/modern-city-environment-64253>.

10. Unity Technologies, "3D Living Room", Unity Asset Store, 2019. [Online]. Available: <https://assetstore.unity.com/detail/3d/environments/urban/3d-living-room-62120>.
11. Unity Technologies, "Customized Characters", Unity Asset Store, 2019. [Online]. Available: <https://assetstore.unity.com/detail/3d/characters/humanoids/customized-characters-134182>.
12. K. Scott, "New Mobile Gadget," 5 Oct 2019. [Online]. Available: <https://newmobilegadget.com/2019/10/05/2d-vs-3d-platformers-the-dimensions-of-operating-and-jumping/>.