

Department of Computer Science
University of Hong Kong
Final Year Project

Final Report

Project title:

‘A journey called growing up’
A 2D puzzle game that raise awareness of
youngster’s mental health

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Abstract

This project focuses on addressing the escalating mental health issues among the young generation in Hong Kong. It is important to raise the awareness of the public towards the problem in order to provide appropriate support and help to the youngsters. This project aims to provide an interactive and entertaining 2D puzzle game to help the youngsters reveal their difficulties. This final report will first give an introduction with the background, current solutions, motivation, objectives and deliverables of the project. The report will then discuss the methodology of the project including the reason of using video game, the technology used, a design of the game and the development process. After that, the result of the project including the finalized game and the feedback survey will be presented. The next section will be a discussion of the possible work in the future. At the end, a conclusion will be provided.

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1. Introduction

This section introduces the background, current solutions, motivation, objectives and deliverables of the project. An outline of this report is also provided.

1.1 Background

In Hong Kong, the mental health of young people has been a serious concern in news coverage and the issue has worsened in recent years. The Hong Kong Jockey Club Centre for Suicide Research and Prevention recorded 22 suicide attempts and death cases among youngsters who were younger than 18 or students of tertiary education from August to October 2023 [1]. The number of cases was doubled compared to 2022 [1]. According to a survey conducted by the Hong Kong Federation of Youth Groups (HKFYG) in 2021 [2], over half of the surveyed secondary school students had symptoms of depression. From another survey conducted by The Chinese University of Hong Kong (CUHK)'s Faculty of Medicine from 2019 to 2023, near one fourth of the surveyed children or adolescents revealed that they struggled with at least one mental health issue including difficulties in staying focused, behavioral disorders, anxiety and depression [3]. These research findings suggest that mental illness has been prevalent among youngsters across different age groups, including children, teenagers, and young adults.

There are many factors pushing to the current mental problem among youngsters. The typical reasons include the difficulties and stress from their studies, pressure from work, insufficient time and social issues [4]. With the competitive education system and public examination (Diploma of Secondary Education exam (HKDSE)) in Hong Kong, some youngsters express that they feel uncertain about their career and worry about their academic performance [5]. COVID-19 is also considered as one of the factors of the current mental health issue especially due to the impacts of school suspension [6].

1.2 Current solutions

Mental health issues in Hong Kong are typically being tackled with two approaches. The first approach is curing including mental health services such as counselling or psychological treatment [7]. This approach aims at reducing or eliminating the impact of mental health problems acting on the patients. However, such curing method requires professional medical or psychological knowledge. Hence, this is not the focus in this project.

The second approach is prevention such as organizing talks and parenting

education [7]. Unlike curing, this method focuses on identifying mental disorders at an early stage and preventing the situation from worsening through education and promotion. Raising awareness is one of the possible ways to achieve prevention. For example, the Mental Health @ School campaign tries to bring teachers, students and parents' attention to mental health by posters, videos and teachers training in order to promote students' mental well-being [8]. However, raising awareness requires attracting people to engage in the topic and an interactive medium such as video game can be effective.

In fact, there is a number of video games that try to dive into the topic of mental health. For example, Mental Health Awareness Game is an educational game that gives accurate knowledge and information about mental health to players [9].

However, there does not appear to be a game that particularly focuses on the current situation of the Hong Kong youngsters. Also, video games are found to be valuable in delivering serious messages, but there are some considerations such as the game design and if the game itself being engaging to players which affect the effectiveness of conveying message [10]. Therefore, a well-designed video game can be a starting point to tackle the current situation by raising more concerns towards the topic.

1.3 Motivation

With the background suggested in section 1.1. The mental health challenges faced by the young generation in Hong Kong is commonly caused by external factors and the people in their immediate surroundings. Identifying the sources of tension faced by youngsters and offering appropriate assistance become important, especially for the public and individuals who are closely connected to the youngsters. To ensure the well-being of the young population in our society and prevent any instance of self-harm, it is essential to enhance the awareness of mental health issues experienced by the youth.

1.4 Objectives and deliverables of the project

1.4.1 Objectives

This project aims at helping youngsters to express their difficulties and raise public awareness towards the mental health issue among youngsters in Hong Kong.

According to a survey conducted by KELY Support Group in 2021 [4], 60% of the surveyed young people chose not to seek assistance for their mental well-being.

The survey revealed that young people tended to conceal their problems.

However, these issues can progressively worsen without being handled properly.

That is why it is crucial to help youngsters to express their difficulties. As they may feel uncomfortable to discuss the problem directly, it would be beneficial to have an alternative to expose the issue and uncover the factors contributing to the current situation as mentioned in the project background.

In addition to assisting youngsters in expressing their concern, it is important to ensure that they receive proper care and understanding. Therefore, the game aims at raising public awareness and promoting a positive attitude towards mental health problems. It is grateful if people can pay more attention on the youngsters and offer appropriate support especially for parents and teachers who play vital roles in reducing youngsters' stress and pressure. Apart from the public, individuals being aware of their own problems is also the key to treat mental disorder. By playing the game, youngsters may find themselves experiencing similar difficulties as those demonstrated in the game and hopefully, they will be encouraged to seek help in real life. The primary objective of the game is not to treat their mental illness since that should be handled by the professionals, but to increase the number of youngsters seeking and getting help for their conditions.

1.4.2 Deliverables

To achieve the project objectives, a 2D puzzle game is developed to provide an interactive way for the public to understand more about the youngsters. The primary platforms of the game are Windows and Mac OS. A survey is also conducted to receive player's feedback including the overall comment on the game and to what extent the game can address the mental health issue.

1.5 Outline of the report

The remaining parts of this report will first discuss the methodology of the project in section 2. The section includes the reasons of using video game, the technology used in this project, the design of the game and the development process. Next, the results of the project which include the finalized game and feedback survey will be presented. Possible future work of the project will be mentioned in section 4. Finally, there will be a conclusion in section 5.

2 Project Methodology

This section discusses the methodology of the project. This includes the use of video game, the technology used, design of the game and development process.

2.1 Use of video game

Video games have been proved to be effective in drawing people's attention towards a serious topic and encouraging making changes in one's behavior [11].

With its interactive features and immersive experiences, players are able to gain a new perspective towards the topic which encourages them to make changes or build up empathy [12]. A study by Shliakhovchuk, Elena has tried to use video game to raise awareness towards refugee crisis and finds that the virtual experience of being a refugee can encourage players to empathize refugee in real life [12]. Similar approach can be adopted in this project by granting players the point of view of youngsters in Hong Kong. Details will be discussed in section 2.3 which is about the design of the game.

2.2 Technology used

There are two main game engines which are the software for game development, Unreal Engine and Unity. Unity is used in this project since it is a more friendly game engine for indie games (games with relatively simpler graphics and lower

budget) while Unreal Engine focuses more on sophisticated graphics. Also, although the game developed in this project is launched in Windows and Mac OS only, more platforms can be covered with further development since Unity supports game development for multiple platforms including both personal computers and mobile phones with minor changes to the codes and export settings. This will enable the game to be published to a wider audience which aligns with the objective of raising more awareness.

Windows and Mac OS are the primary platforms. The programming language for development is C# which is the language used by Unity and object-oriented programming is adopted. For the graphics, in order to focus more on game design and development, generative artificial intelligence like Microsoft Designer and other online resources are used. Online tools such as Adobe Express are also used for editing the images generated by the AI tools. For sound effects and background music, copyright-free resources on the website Pixabay are used.

2.3 Design of the game

2.3.1 Analysis on existing games about mental health

It is found that there are two types of video games about mental health during

the research. The following analysis is the summary of game reviews online and my personal review after watching the gameplay videos online.

The first type is directly providing information and knowledge about mental health in an interactive way. An example is Mental Health Awareness Game developed by Focus Games [9] (Figure 1 and Figure 2). It is an online board game with questions assisting players to understand more about mental health issue. It is informative and educational, but since the gameplay is only about answering questions, it may not be appealing enough. Therefore, it is important to strike a balance between being educational and engaging in the project. Puzzle game will be a suitable genre for providing an interesting gameplay and a sense of accomplishment to players without being too complicated and stressful.



Figure 1: Gameplay of Mental Health Awareness Game 1. Adapted from [9]



Figure 2: Gameplay of Mental Health Awareness Game 2. Adapted from [9]

The second type is delivering meaningful messages about mental health by storytelling and gameplay in a subtle way. An example is *Fractured Minds* by Emily Mitchell. It is a 3D puzzle game that uses the game world to present the feelings and emotions of mental health illness patients [13] (Figure 3). Another example is *Sea Of Solitude* by Jo-Mei Games [14] (Figure 4). It is an adventure game that guide players to go through the feelings of loneliness by the story and game world. Both games use the approach of conveying messages by the elements of the game instead of directly providing information to players. It is found that serious presentation fails to convince players to accept the meaningful message contained in the game [10]. This type of game gives players an immersive experience and allow players to understand the message throughout the game instead of being presented directly. This also gives more flexibility to the game which can have a more attractive and interesting playing experience.

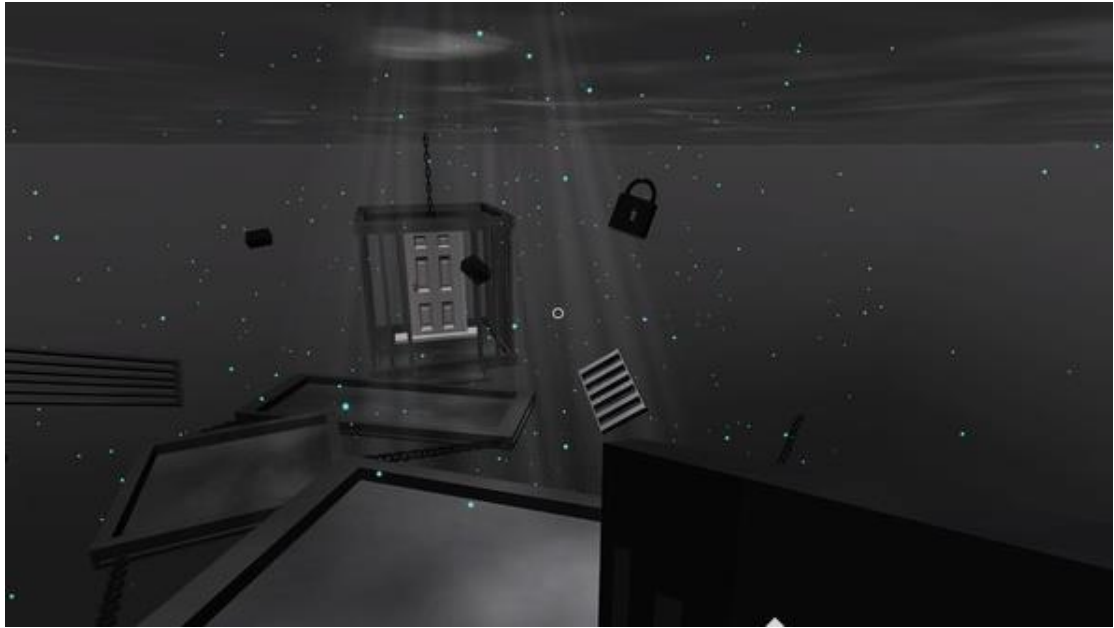


Figure 3: Gameplay of Fractured Minds. Adapted from [15]



Figure 4: Gameplay of Sea Of Solitude. Adapted from [16]

2.3.2 General design

The genre of the game is 2D point and click puzzle game. Since the target player is the general public, the gameplay is designed to be simply point and click without complicated game mechanics. The game interface is similar to Rusty Lake Hotel which is a 2D point and click puzzle game in the market

(Figure 5). The screen is separated into the game scene and the item list. Each game scene consists of puzzles and items. There is a sequence of solving the puzzles since some puzzles require certain items to solve and some items can only be unlocked with certain puzzles being solved. The collected items are shown in the item list. The items can be used by clicking them in the item list and interacting with the game scene. The main challenges for players are solving the puzzle in a correct sequence and choosing the correct items for the corresponding puzzles. Player is required to solve all the puzzles in a game scene with the collected items in order to proceed.



Figure 5: Gameplay of Rusty Lake Hotel. Adapted from [17]

With study mentioned in section 2.1 and the analysis in section 2.3.1, the game adopts the story-telling element from Sea Of Solitude in order to grant players new perspective. There is a story about an older brother who has struggled with

mental illness and left home alone. Player acts as his little brother and solve the puzzles left by him in order to uncover the difficulties faced by him and understand more about his feelings. The puzzles are designed to reflect the challenges faced by youngsters. This encourages players to immerse themselves in the story and have a better understanding of the core message behind the game which is ‘youngsters need external help for their mental health issues’.

With such approach, the game can be both engaging and meaningful.

2.4 Development process

This project adopts an agile approach for development. After the preparation work including analysis of existing games which has been demonstrated in the previous section, the developing process is mainly a loop of game design, implementation and playtest. Interim products which are individual puzzles are created. Playtest is conducted on each puzzle. Changes may be made to the puzzles from time to time according to the feasibility and playtest. Individual puzzles are then combined into 3 different game scenes. Playtest is conducted again on each game scene. Since this stage focuses on the feasibility of creating the puzzles in Unity, only simple and draft graphics are used.

After the core gameplay being finished implementing, the game is polished with detailed graphics generated by AI tools and other game elements including sound effects, a menu, an opening scene, an ending scene and background music. A final playtest is conducted on the whole game.

At the end of the project, a number of players are recruited to play the game. After their playthrough, a survey is conducted for player’s feedback about the game and review in what degree the game has achieved the objective which acts as the result of the project.

The following is the detailed schedule of the project:

Date	Task	Status
September 2023	<ul style="list-style-type: none"> - Confirm project topic and scope - Detailed project plan - Project web page 	Finished
October 2023	<ul style="list-style-type: none"> - Research on similar games and game design - Game design (story, puzzle design) - Test feasibility of the designed puzzles in 	Finished

	Unity	
November 2023	<ul style="list-style-type: none"> - Game design (puzzle design) - Test feasibility of the designed puzzles in Unity 	Finished
December 2023	<ul style="list-style-type: none"> - Preparation for first presentation - Combine puzzles into game scenes - Playtest on game scenes - Detailed interim report 	Finished
January 2024	<ul style="list-style-type: none"> - Graphic design and story element - Game design for functionality (e.g. menu, end scene, setting page) 	Finished
February 2023	<ul style="list-style-type: none"> - Sound effect, background music - Prototype of the game - Test and debug 	Finished
March 2023	<ul style="list-style-type: none"> - Final playtest on the whole game - Finalize the final game product - Final report - Survey on the game 	Finished
April 2023	<ul style="list-style-type: none"> - Prepare for final presentation 	Finished

	- Prepare for project exhibition	
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Table 1: Detailed Schedule of the project

3 Result

This section discusses the results of the project which includes the presentation of the finalized game and the result collected by the feedback survey.

3.1 The finalized game

3.1.1 Core gameplay

As mentioned in section 2.3.2, the game will be based on the design of Rusty Lake Hotel. Here is the interface of the game:



Figure 6: Game scenes of the project 1



Figure 7: Game scenes of the project 2



Figure 8: Game scenes of the project 3

Players are able to browse across different scenes at any time. Players are also required to explore all scenes and make use of resources from different scenes in order to solve some puzzles.

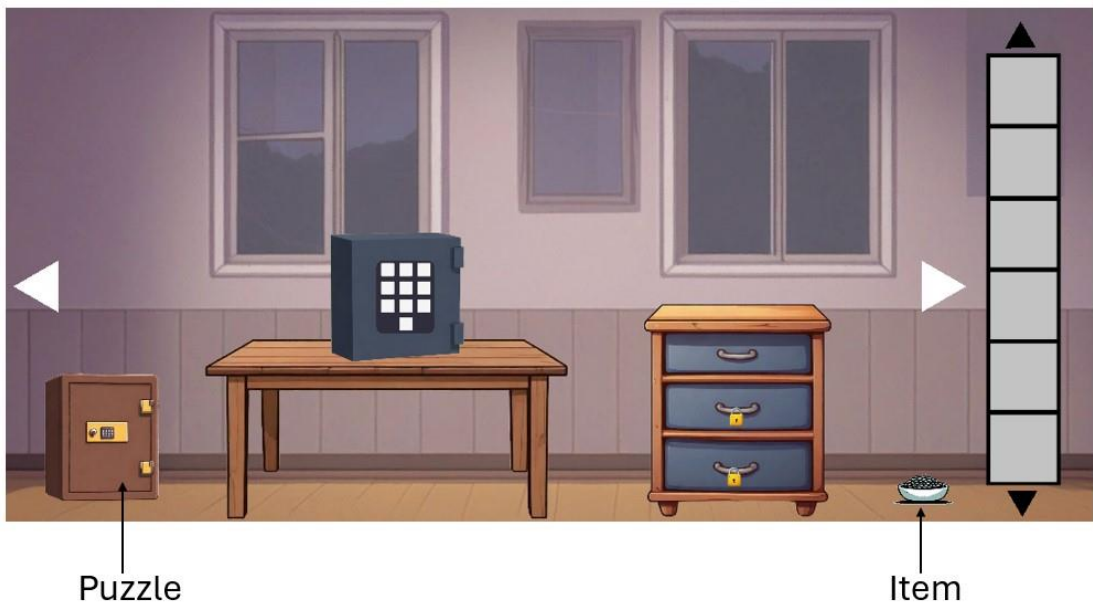


Figure 9: Game scenes of the project 4

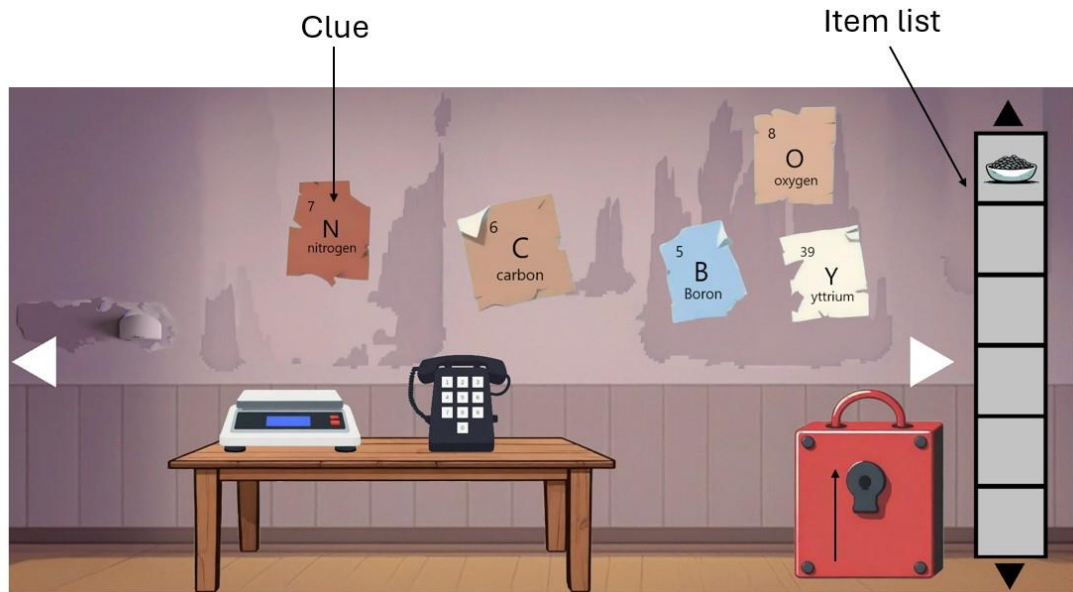


Figure 10: Game scenes of the project

3 objects including puzzles, clues and items (Figure 9 and Figure 10) are provided. The gameplay is basically finding correct clues and items to solve a sequence of puzzles which can be achieved by only mouse clicking. Clues are hints for player to solve a corresponding puzzle. Items are the tools for players to solve puzzles or discover more clues. Items can be collected by searching the game scene or solving puzzles. The collected items are stored in the item list and can be used at any time by clicking them in item list (Figure 10).



Figure 11: Game scenes of the project 6



Figure 12: Game scenes of the project 7

Puzzles are the main tasks for the players. They come in different difficulties from simple interaction with a certain tool to complicated code-solving problems. For example, using the collected seeds to feed the bird in order to get a key (Figure 11) and figuring the password by the equation provided in the clue (Figure 12). All of the action mentioned can be performed by just mouse clicks and sound effects will be played for most interactions.

3.1.2 Story

As mentioned in section 2.3, a story is written for the game to provide an immersive experience to players and help them gain the perspective of the youngsters. The story is mainly presented in the opening and ending of the game in the form of cut scenes and dialogues.

The opening mainly provides the background of the story which presents a character with mental health issues and family problems. This gives the players a first sight of the difficulties encountered by youngsters. The cut scenes change when players read the story in order to provide immersion visually (Figure 13 and Figure 14).



Figure 13: Opening of the project 1



Figure 14: Opening of the project 2

During gameplay, additional information about the story can be found by interacting with some game objects in order to build a stronger connection between the gameplay and story. For example, players can figure out that the character is forced to study chemistry due to parents' decision by interacting with the posters on the wall (Figure 15). More difficulties experienced by youngsters such as academic pressure and the impacts of the pandemic are mentioned (Figure 16).

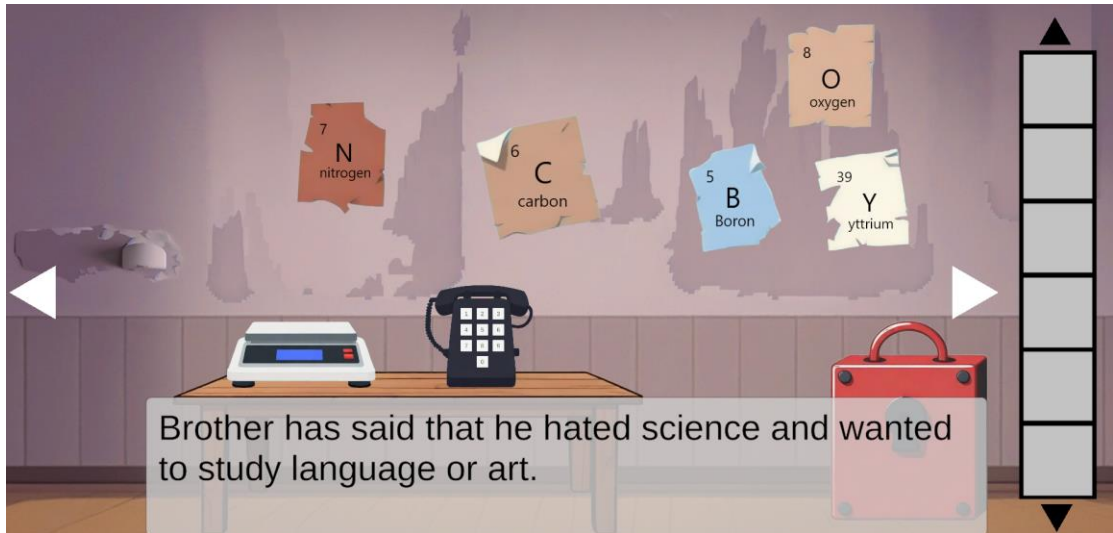


Figure 15: Additional information about the story during gameplay 1

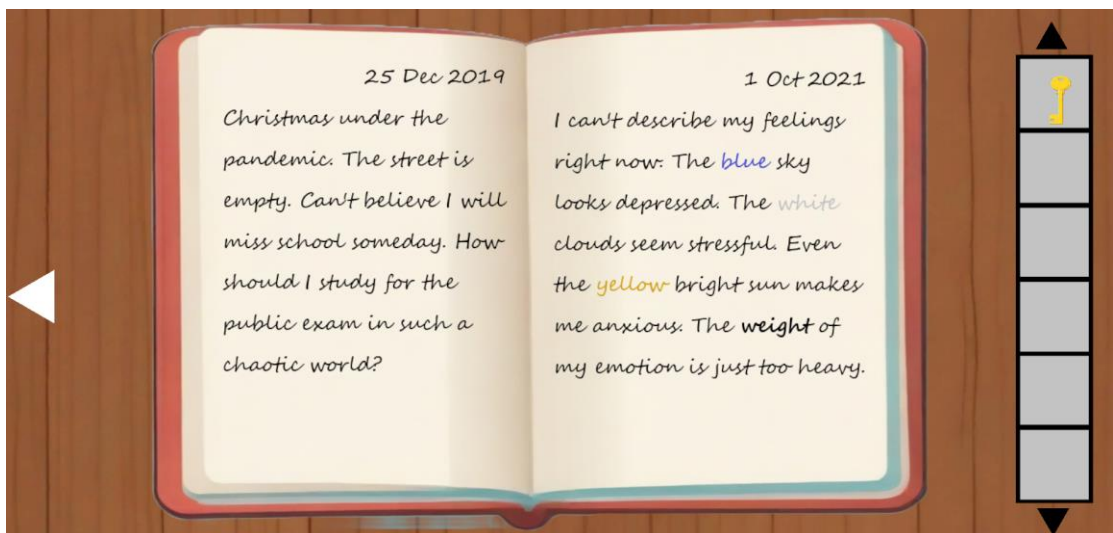


Figure 16: Additional information about the story during gameplay 2

At the end, a positive ending is presented in a similar way as the opening. The ending aims at promoting a positive attitude towards the mental health issue and encouraging players to take action such as actively communicating with youngsters (Figure 17).



Figure 17: Ending of the game

3.1.3 Graphics

The graphics in the game are separated into two types: the art during gameplay which are shown in the 3 game scene mentioned above in section 3.1.1 and the art for other parts of the game such as the opening. The art during gameplay is expected to be in simplistic style in order to provide a clean and clear scene for players to focus on the puzzles and problems while other arts can be more sophisticated to enhance the attractiveness of the game.

For the art during gameplay, at first, only Scenario is chosen to be used since it is specific for game assets. It was proposed to be used for generating the whole game scenes. However, the resulted images may contain excessive elements which are not included in the prompt. For example, a prompt “an empty room,

two windows, wooden floor, daylight, gameart” is provided. The resulted image contained additional furniture and windows which make the scene messy (Figure 18). Players may also be confused on which objects they can interact with. Therefore, it was decided to separate the generation of background images and object images.



Figure 18: Image generated by Scenario 1

Scenario is still used to generate the background image for the game scenes. Since it supports the use of reference image, a more desired image which is a completely empty room can be produced (Figure 19 and Figure 20). Although the use of reference image increases the chance of getting images fulfilling the requirement in prompts, considering the similarities between the reference image and the generated image may be a concern in the real game industry, this

project does not rely on the use of it and has only used it once for the image shown in Figure 20.

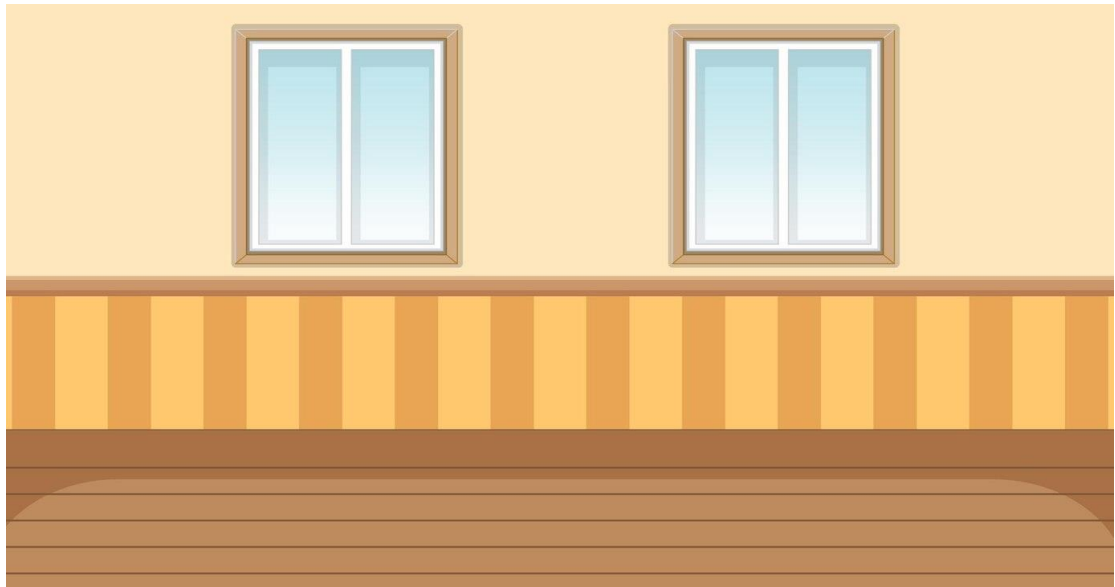


Figure 19: Reference image



Figure 20: Image generated by Scenario 2

For the graphics of game objects, Layer AI is used since it is also labeled as AI tools for game arts. One of the strengths of Layer AI is the ability to produce

image of a single object which is suitable for creating images for game objects.

An art style can also be chosen which makes the game scenes look more consistent. However, some words may not be understood by Layer AI and the desired images of some specific objects may not be generated. An example encountered in the project is creating an image of a bottle of glue (Figure 21).

Microsoft Designer which is another AI tool being capable of creating images of a single object is used to address the issue (Figure 22).



Figure 21: Image generated by Layer AI 1



Figure 22: Image generated by Microsoft Designer 1

Another problem for Layer AI is that some specific details of an object may not

be correctly generated. For example, with the prompt “2d game asset in simplistic cartoon style, a telephone with number pad”, the number keys on a telephone may not be correctly displayed (Figure 23). Therefore, manual modification is needed especially modifying the details and removing background of the images. Adobe Express is used for this process.



Figure 23: Image generated by Layer AI 2

Apart from the game scenes, cut scenes are also required for the opening and ending of the game. With no players’ interaction involved, the graphics can be more sophisticated and attractive since they are used for presenting the story.

Leonardo AI is used since the produced images are more artistic. However, it still has some limitations such as the difficulty in generating human characters for most of the time such as the incorrect position of limbs (Figure 24). Prompts

are modified to avoid those limitations and still match the scenario described in the story. For example, describing the environment stated in the story instead of describing the character's actions.



Figure 24: Image generated by Leonardo AI

With the use of 4 different AI tools, consistency of the art style may be a problem. A simplistic cartoon style is adopted and stated in every prompt since less details in the artwork can minimize the difference among images.

Overall, the potential of using AI generated images in game development has been seen in this project. However, manual modifications and careful prompt design may be needed to cope with the limitations. Copyright issue may also be a problem in real life situations.

3.2 Survey

3.2.1 Limitations

First, due to cybersecurity concerns and lack of an authoritative platform, the game has not yet been published to the public. The participants of the survey are recruited by invitation instead of random sampling. Therefore, the number of participants is limited and the result may contain bias.

Second, since the objective of the project is to raise awareness, subjective opinion which may contain bias is the only way to evaluate the project's effectiveness. The survey results may vary with a different group of participants.

The result should be taken as reference only and should not represent the view of the general public which is the target player. A more complete playtest should be conducted in the future.

3.2.2 Survey result

10 participants are involved in the playtest and provide responses to the survey. 9 of them are young adults of age between 18 and 30 and 1 of them is an adult

with age between 30 to 60. Given the age groups of the participants, the survey results mainly reflect opinions from young adults and other age groups may have different views.

The questions of the survey are designed based on the posttest survey used in a similar study which investigates the impact of video game in raising awareness to a social topic [12]. The survey consists of 3 parts including overall feedback to the game, changes in knowledge and attitudes towards the topic and the willingness of taking actions [12].

The first part is a single question that collects the overall rating of the game which includes graphics, gameplay, story, user interface and other game elements in a scale of 1 to 4 with a higher rating representing a higher level of satisfaction. The average rating is 3.5/4 which shows that most participants agree that the game is well-developed.

The second part contains 5 questions for evaluating the effectiveness of the game in raising awareness. Each question is rated in a scale of 1 to 4 with a higher rating representing that the participants agree with the statement by a

larger extent. The following is the average scores for each question.

Question	Average score
1. Do you understand more about the difficulties encountered by the youngsters after playing the game?	3.3/4
2. Do you understand more about the youngsters' mental health situation after playing the game?	3.3/4
3. Do you think playing the game helps to foster a positive attitude towards mental health issue?	3.1/4
4. Do you think the game can motivate players to pay more attention to youngsters' mental health issue?	3.3/4
5. Do you think the game is a more effective approach than the existed promotion (such as poster, leaflet, talk, campaign, etc) in raising awareness of youngsters' mental health issue?	3.2/4

Table 2: Survey part 2 result

Overall, the average score in this part is 3.24/4. participants reveal that the game is able to convince players to be more aware of the youngsters' mental health issues. It is also suggested that the game is a more effective method in promoting the issues than the existed approaches. One possible reason may be

the active participation in video game instead of passively receiving information.

The third part is a single question that ask if the participants agree that the game can encourage players to actively offer help and care to youngsters. The question is also rated in a scale of 1 to 4 as the questions in the second part. The average score is only 2.4/4 which is lower than being satisfactory. This may be caused by various reasons such as personal choices or whether there is such requirement of assistance around the participants, but the most possible reason can be most of the participants being youngsters who should be the ones receiving assistance. Further investigations should be done for the result in willingness of taking actions.

4 Future work

First, the most important work is to find a platform for publishing the game. Since the game is basically an unknown software to the public at this stage, an authoritative platform will be effective in promoting the game. Cooperation with organizations which are working for youngster mental health such as The Hong Kong Federation Of Youth Groups or The Centre of Development and Resources for Students (CEDARS) in The University Of Hong Kong can be considered. Apart from that, the game can also be launched to popular gaming platform such as Steam to provide a valid and trustworthy channel to players for downloading. This can also allow a larger scale of collection of result as the player base is expected to increase.

Second, regarding the game itself, more content can be added in the future. For example, additional levels with stories of new characters can be added. The difficulties or cases that are not mentioned in the current version such as cyberbullying can be included. Real life cases can also be adopted by interviewing mental health patients. The game can also be launched in other devices such as mobile phone to increase the player base.

Third, the game can be further polished with the advance of generative AI. At this moment, most of the graphics in the game are stationary images. With the development of video generative AI like Sora from OpenAI, animated game assets may be generated in the future and more visual stimuli can be provided to players. Also, the opening and ending of the game can be presented in the form of animation and video instead of cut scenes and dialogues.

5 Conclusion

This project aims at improving the current mental health issue of young people in Hong Kong through the development of an interactive and entertaining 2D puzzle game. The game will help youngsters reveal their difficulties and raise the public's awareness to the issue in order to encourage more people to provide appropriate help to the youngsters. Given that one of the most important features of a game is being engaging, the message of the game, 'youngsters need external help for their mental health issues', is mainly delivered through the meaningful story and well-designed puzzles. The game is finalized and tested by a small group of participants. Preliminary result is obtained and shows that the game overall achieves the objectives. However, more feedback should be collected to further evaluate the effectiveness. The game can also be further developed in the future to attract a larger player base. Hopefully, this project can help coping with the youngsters' mental health issue in Hong Kong in a larger scale with further improvement.

Reference

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