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Master's Thesis
Academic Year 2019

Treastory: Design of a Game to Arouse Interest
of History Learning for Chinese Youths through
Repairing Cultural Relics using Object-based
Learning Approach



Keio University
Graduate School of Media Design

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A Master's Thesis
submitted to Keio University Graduate School of Media Design
in partial fulfillment of the requirements for the degree of
Master of Media Design

Yang Jin

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Abstract of Master's Thesis of Academic Year 2019

Treastory: Design of a Game to Arouse Interest of History
Learning for Chinese Youths through Repairing Cultural
Relics using Object-based Learning Approach

Category: Design

Summary

History subject stands on a vital role in promoting the spirits of patriotism, among the youths. Learning history is an appropriate for youths training dialectical thinking and learning lessons from past failures. However, in today's China, lack of creativity in history teaching has led to the low interest level among students in learning history. Several studies has discussed about how to arouse students' interests of history learning by object-based learning (OBL) approach. But, there are still some limitations left behind that need to be discussed.

Treastory is a single player game designed for Chinese youth that provides an immerse experience of learning history from a cultural relics repairer's aspect. This research aims to integrate Object-based learning into digital form, To explore a new method of history learning using object-based learning approach via game design so that to increase Chinese youths' interest in history.

Keywords:

Game Design, History, Cultural Relics, Object-based Learning

Keio University Graduate School of Media Design

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Chapter 1

Introduction

History subject stands on a vital role in promoting the spirits of patriotism among young generation. Furthermore, learning history is an appropriate way to train youths in dialectical thinking and learning lessons from past failures. Especially in China, a country with over 4000 years of history, the importance and benefit of learning history had been shown in the sustainability and current rapid development. However, a serious issue has emerged in the rapid-developed China, the lack of creativity and interest in history teaching had made students lose interest in history. Many educators discussed about several approaches of how to arouse student's interest of history learning, where object-based learning (OBL) has been evidenced as a suitable method. However, there are still some limitations left behind that need to be discussed.

This research discusses a topic of how OBL can be continually used in digital forms in order to Cater to China's specific educational condition, it aims to explore a new method of history learning via game design to arouse Chinese youths' interest in history.

1.1. Why Cultural Relics and History: A Personal Story

As Schell had said, before coming up with specific ideas, game designers need to "be certain of why they are doing it" (Schell 2008). It is important to elaborate on the personal experience behind this research.

My answer was always "Not really" when people said that "You must be like learning history so much." It's a common reaction when I mentioned that I chose history learning as my research topic. My answer does not mean that I

dislike history, but has a complex feeling on it.

I was one of the students who had totally lost interest and curiosity in history as previous chapter introduced. I was not good at memorizing knowledge via rote learning, which led to my poor grades in history subject. The lack of confidence in learning history had made me escape from knowing more and treat the subject as a symbol of “ pain ” , even after high-school.

The situation took a favorable turn when I first met Touken Ranbu Online, a game that players assume the role of a sage who has the ability of traveling into the past and animating Japanese legendary swords which are depicted as young man.

The huge impact of the game on me was that for the first time in my life I realized that I could clearly recall specific Japanese historical event and wanted to know more after I had watched a scene of a short conversation between swords.

The scene was about the two swords whose owner was Okita Soji, the captain of the first unit of the Shinsengumi in Japanese history. They talked about how much they grieved and missed the captin on the thought of his death. They said they could have saved his life if they could go back to time and change the history, but they know it ’ s impossible.

A conversation between cultural relics and its owner does not exist and might never happen in the reality. Therefore, the imagination strengthens the empathy of audience by endowing the cultural relics with characteristics and showed its relatedness with history.

Looking back the past, I realized that history was boring only when it was expressed in a lack-of-interaction term. An interaction can be a cause and effect of player ’ s decision in the game; a connection of cultural relics and its historical background; an emotional empathy of player and historical figures.

1.2. Questionnaire of Interest and Attitudes of Learning History in China

In order to specifically understand the current situation among youths ’ interests and attitudes of Learning History in China, this research conducted a questionnaire in 10 middle schools from Jan 13rd to Jan. 23rd, 2019. There were 490

students as participants.

Cross-over analysis of Q14 and Q13 can be seen in Figure 1.1 below.

Firstly, youths are losing direction in seeking new way of learning history. According to the cross-results of “Q14. Have you ever thought of seeking a new way of learning history?” and “Q13. What kind of problem do you have in learning history?”. Those who had thought of changing method of learning history had a major problem of not knowing how or where to seek for appropriate one. It is actually a good symbol that youth are moving toward the positive attitude on learning history.

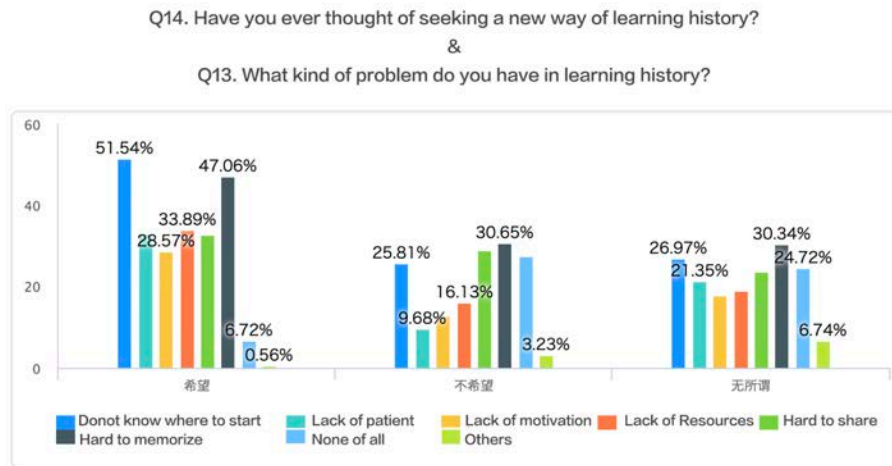


Figure 1.1: Cross-over Analysis of *Q14* and *Q13*

Secondly, youths are more likely to approach and acquire history knowledge from digital media.

The outcome of the questionnaire showed that young Chinese’s knowledge of history usually come from TV shows, drama, or history-related game. There is a keyword that appears frequently in the answers to the question of “Please write down the opportunities that make you interested in history” called “National Treasure”.

National Treasure (Figure 1.2) is a 2017 Chinese cultural exploration reality TV program that aired on CCTV in China. Each of the nine major museums in China presented three national treasures across the episodes. Celebrities and common

people tell the stories of national treasures with the collections, interpreting the historical mystery.

It lowers the threshold of appreciating cultural relics through various shows and meet the needs of those prefer watching entertainments to documentaries. This is a surprising finding since most Chinese young people seemed rarely have interest in cultural relics in general. Whereas, “Natural Treasure” did attracted a big number of young audience by inviting famous public person to talk about the background stories of those cultural relics. This finding had inspired me to focus on the effect of object.



Figure 1.2: Overview of *National Cultural*

Thirdly, a majority of students' time for playing games on smart phone or tablet is fragmented.

Different to the previous days, within the rapid development of technology, young generations are generally using smart phone and tablet to deal with a big amount of tasks. As a result, their game experience is usually fragmented, which leads to young generations' habits of playing games in the middle of the daily tasks.

In the other hand, young Chinese do not have much spare time for themselves due to the rigorous educational environment. The survey had shown that students usually spent their weekends on attending several extra-curricular classes. Some of them are forced by their parents, and some are forced by the worry of cannot keep up with the study in school. Therefore, they mostly only have spare time after school in the night, as well as when they're moving on the transportation.

This finding can be considered as a great opportunity to find out a new approach of fragmented learning.

This finding is related to another result in the survey about students' frequency of visiting museums that only a small number answered that they go visit often like once per month. Whereas, when being asked how they spend their daily spare time, 81 percent students answered "playing smart phone games".

In summary, young Chinese are facing to a problem that even they have interest in history, they do not have much motivation and patient to approach, since their spare time is fragmented and limited.

Therefore, digital media can be considered as a compatible platform for them to receive knowledge of history. Particularly, portable devices, such as smart phone that are integrated into daily life, may have its power of spread further content easily to those young Chinese.

Moreover, the approach of cultural relics has shown positive effect on attracting young Chinese, which is the reason that cultural relics has been chose as the main object in this research.

1.3. Issues in History Learning

Nowadays, especially in the early years, Chinese youths' impression of learning history can be likely linked to negative description such as "dreary", "boring", "unnecessary". Those negative impressions mostly come from their memories of high-stress education at schools.

The intense competitive educational environment in China forces a number of schools to pursue method of learning by rote, especially in the history subject, which has the largest volumes due to China's long river of history. The dreary rote learning method made young Chinese not only feel stressful, also losing interest and patience.

According to the previous survey, the difficulty of memorize history knowledge can be summarized into following major causes.

1. The singularity of communication content and the one-way communication pattern in history class lead to student's distraction and low motivation in learning.

2. History knowledge can hardly be used in daily life, which leads to student's lack of reviewing and independent thinking.

3. Historical events are mostly separated from each other, missing the part of cause and effect to make them reasonable.

4. Historical figures are mostly painted into similar faces with nondescript description in text book which makes student hard to distinguish and remember.

Some entertainment contents, such as documentary, drama or anime, have already made a approach of solving the third and forth issue by enhancing historical figures' characteristics and the drama of stories. This research will mainly focus on the first and second issue that had been left over.

1.4. Game Situation in China

Game as a part of entertainment industry stands for a considerable part in Chinese people ' s daily life.

The upgrading of high-speed wireless environment and the large user base of smart phone made China quickly became a flourishing smart phone game market. Up until 2019, mobile games are the dominant segment with a 64.6 percent market share. With more game titles to be launched, companies are expected to see a growth in their revenue generation capacity and market share.

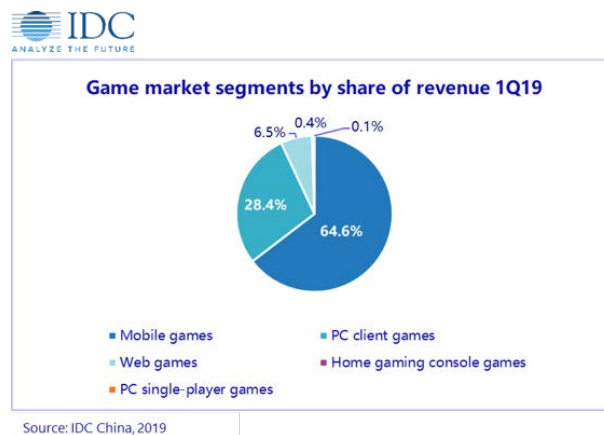


Figure 1.3: Game Market Segments by share of revenue 2019

As the game industry develops, people's perception of playing game is moving in a more positive side.

In short, tablet game is a very adaptable tool of fragmented learning with great potential in terms of content innovation. This research chooses tablet game as the approach method in order to seek the way of improving interest of the youths to history.

1.5. Concept of Treastory

Treastory is a single player tablet game designed for Chinese youth that provides an immersive experience of learning history from a cultural relics repairer's aspect. This research is about exploring a new way of learning history via game design to arouse young Chinese curiosity by using object-based learning approach.

In this research, the name "Treastory" is used to refer to the game itself. When referring to the research, this essay uses "this research" for the purpose of differentiation.

For the purpose of making a fast overview of the game Treastory in this research, Treastory can be defined into three aspects.

Firstly, Treastory is a single-play tablet game using touch screens as its main interaction.

Secondly, Treastory is an adventure game brings alive Chinese history in virtual world. It includes role-play and puzzle solving as the core game play.

Thirdly, Treastory is an experience-oriented game put emphasis on the use of history knowledge and the activities around objects.

1.6. Thesis Structure

Chapter one introduces the current situation of young Chinese's attitude of learning Chinese history, as well as its difficulties, the education environment and game situation in China. Mainly addresses the goal and approaches of this research.

Chapter two discusses some academic researches and approaches which related to the goal of this research. Discuss how others work to arouse young generation's

interest of history as well as the limitation that lead to the main challenge of this research.

Chapter three mainly summarises the design process of the game "Treastory", includes the result of the first user test with beta version game.

Chapter four talks about the improvement of game design in alpha version as well as the result of the final user test, discusses the evaluation and its process.

Chapter five as the final chapter summaries the entire research's goal, challenge, research background, design process, and evaluation. Also includes future plans and possible development of the design.

Chapter 2

Related Works

2.1. Object-based Learning

Object-based learning(OBL) is a mode of education which involves the active integration of objects into the learning environment. (Chatterjee HJ 2015). It is a form of active learning (Freeman S 2014) that enables learners to explore ideas, processes and events related to the object.

Different from other approaches of learning, OBL links student activity to meaning by challenging the student to engage with the object.It represents a constructivist approach in which the students develop their knowledge and understanding through interaction.(Chatterjee HJ 2015)

A core facet of OBL is its multi-sensory nature; the use of objects in teaching invokes a variety of senses and encourages a form of interactive or experiential learning.Most importantly, OBL can arouse curiosity and encourage critical and analytical investigation and evaluation, generate deep learning opportunities.

The educators have been discussed many of OBL's applications in various fields, such as hands-on workshop in school, exploration in museum tour, cultural introduction in e-learning. They all worked efficiently on arousing learners' curiosity and engagement. However, some issues had been left over according to the result in the report of the activities.

- Inflexible place and time

As the research mentioned in chapter one, young Chinese hardly spend their spare time on visiting museum or attending workshop due to the education environment in China. Sometimes they can ' t fit the time schedule, since most of the activities are constructed in a situation of being outdoor. Participants usually have to adjust their time in order to cater the organizer's

time schedule. Sometimes they have problem like they won't have enough money or time to go to another city.

Therefore, some people who are willing to attend might face a problem of lack of time as well as the long distance between their place.

- Restricted behavior

Another issue is that participants' behavior are usually restricted. Many researchers had mentioned that cultural relics are usually too precious that hard to ask for using them in the workshop. Using objects in the activities has its limit on re-usability and safety, especially in hands-on activities. In most of the cases, they only allowed people to just look at them without touching, It lead to the result that participants can not move freely around the cultural relics.

Furthermore, workshops are mostly group works, which requires the participants to have social communications with others. It worries specific groups of people who prefer to stay alone. They may have to face the problem of being uncomfortable with strangers around.

Table 2.1: Existing Problem of education programs using OBL approach

Category	Hands-on workshop	Museum tour	E-learning
Flexible place and time	x	x	△
Review and retry	x	△	○
Behave Freely	x	x	○
Full Engagement	○	○	x
Meaning-making	○	○	x

Combining the previous discussion of Chinese youth's current situation in study, these limitations lead to the fact that the activities are hard to be implemented in China. It is crucial to seek alternative routes of using OBL approach.

Due to the game situation in China, applying OBL into digital form is a considerable solution of inflexible place and time, as well as behavior restricted issues. By the same token, OBL in digital form also has its disadvantage:

- Lack of Multi-sensory Learning

It is obvious that when OBL change into digital form, the learning will lose a sense of touch and smell. This limitation can be considered as a big challenge of maintaining the engagement of experience.

- Lack of Meaning Making and Communication

The processes of meaning-making are distributed amongst group members and that by sharing this knowledge or ‘ cultural capital ’, the group knows more than the individual.(Rowe 2002) OBL in digital will be mainly recognized as an individual media without discussions among group members.

Altogether, how to make OBL consistently exert positive effects on encouragement even in digital form is a big challenge in this research.

2.2. The Level Of Engagement

As a matter of fact, the level of engagement in the learning is important according to its frequency appearance in many studies of OBL. The psychologist Mihaly Csikszentmihalyi proposed the concept of flow, describing the state of complete immersion that individuals enter when they are fully engaged in an activity(Csikszentmihalyi 2008) . Based on psychology, Csikszentmihalyi ’ s flow experience involves the full engagement of affective domains, including feelings, attitudes and emotions, leading to complete focus and in turn enhanced learning or performance.

Additionally, Kolb advocates that in order to gain real knowledge, the learner must go through a cycle of learning (Figure 2.1)by being actively involved in the experience. Next the learner must reflect on the experience, use analytical skills to conceptualise the experience and undertake problem solving in order to apply new knowledge gained from the experience through a process of experimentation.

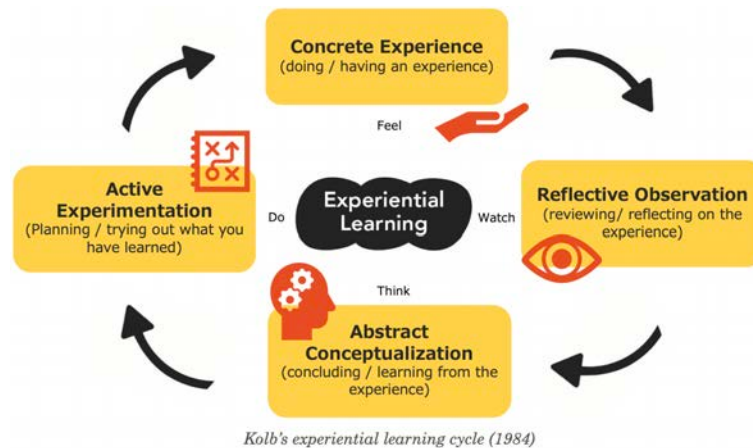


Figure 2.1: Kolb's experience learning cycle

To sum up, full-engagement facilitate deep learning. It requires five aspects: clear and consistent goal, immediate and unambiguous feedback, problem solving, experimental try and error, positive attitude and emotions.

2.3. Game

2.3.1 Game as a Learning Tool

Teaching processes have changed in a positive way by graphic designs in video games and so technological innovations have taken a more important role in teaching process.(Miller 2015)

Monopoly, as a well-known example that it was developed by educational purposes at the beginning.(Bogost 2008) Even though Monopoly put emphasis on the entertainment rather than teaching, many studies had shown that the participants had an unconscious learning of crash management. In addition, the decisions they made in the game gave them a chance of training analytical thinking.

Education related games had been divided into two aspects: Entertainment education game and simulation game, which had been combined into a category of "serious game" in current years. According to the definition of both, simulation game is more close to serious game. On the other hand, entertainment

education game is more close to "edutainment". Different from the reality-pursing simulation game, Edutainment focuses more on the interactivity, enjoyment and encouragement of the game experience.

These games have been widely used in supporting learning in-side and out of school. They delivered effective and engaging learning especially to the children.

As a result, adventure was chose from the ocean of various genre of games as the main game style of Treastory. Adventure game is a video game in which the player assumes the role of a protagonist in an interactive story driven by exploration and puzzle-solving.(Rollings 2003). It mainly focus on the storytelling and interactions. Therefore, adventure game can be a suitable carrier of deeply experiencing historical stories.

2.3.2 Games about History

There 're several games available in the market that are designed about history and had prominent efficiency on arousing players' interest in history.

- Assassin's Creed Series

Assassin's Creed is an action-adventure stealth video game franchise. The series features historical fiction, science fiction and characters, intertwined with real-world historical events and figures. Players control an Assassin in the past history using their skills with the exploitation of the environment. (Figure 2.2)The game is set in an open world and presented from the third-person perspective. Players have freedom to explore the historical settings as they finish main and side quests.



(Source: Assassin's Creed Series Website)

Figure 2.2: Assassin's Creed

In fact, many participants who answered the questionnaire mentioned previously gave the answer of "Assassin's Creed Series" when they were asked to write down the opportunities that made them interested in history. It is undoubted that Assassin's Creed Series is impressed on arousing interest of history for youths, which is a great example for Treastory to refer.

- Dynasty Warriors Series

Dynasty Warriors ¹(Figure 2.3)is a series of hack and slash action video games created by Omega Force and Koei. The series is a spin-off of Koei's turn-based strategy Romance of the Three Kingdoms series, based loosely around the Chinese historical text Records of the Three Kingdoms.



(Source: Dynasty Warriors Series homepage)

Figure 2.3: Dynasty Warriors Series

The second place of the answer went to the Dynasty Warriors Series. In the same way, it had shown an impressive influence on the wide-spread knowledge of the Three Kingdoms not only in China, also to the whole world. Thanks to the unique character design that the youths can easily remember and recall their historical story. It inspired the project to focus more on the storytelling and design of the characters in the game.

- Detective Di: The Silk Rose Murders

In Detective Di: The Silk Rose Murders ²(Figure 2.4), players act as the legendary detective Renjie Di, explore and unravel narrative twists and turns using familiar adventure gameplay mechanics such as exploration, dialogue choices, interaction with objects and clues, and puzzle-solving.

Detective Di: The Silk Rose Murders took an unique aspect to access the history, an well-known detective's adventure in Chinese history. The gameplay is very typical in adventure games including exploration, decisions, interactions and puzzle-solving. Different to the previous games that were focus on the gameplay of action, it lower the threshold for those who are not good at playing action games.



(Source: Detective Di: The Silk Rose Murders homepage)

Figure 2.4: Detective Di: The Silk Rose Murders

2.3.3 Summary: The Challenges

Nevertheless, using OBL is a great approach of arousing learner's interest by invoking a variety of senses which can enrich the engagement and the interaction in an experiential learning cycle. However, it is desirable to consider how OBL can be continuity used in digital forms in order to Cater to China's specific educational condition.

Adventure game, as a well-known digital form, can be considered to become an efficient approach of learning history by its interactive and immersive play style. Even though there were already many titles had shown a great influence on arousing interest of history, they are more focus on action part or puzzle-solving part which raised the bar of playing as well as lowered the education part. Overall, it can be thought of a big challenge that how object-based learning can be efficiently applied in game design in order to arouse young Chinese's interest.

Notes

- 1 Dynasty Warriors Series homepage
<http://www.gamecity.ne.jp/smusou/>

- 2 Detective Di: The Silk Rose Murders homepage
<http://www.detectivedi.com/>

Chapter 3

Game Design

3.1. Introduction

This chapter mainly introduces the design process of Treastory, discusses how the game had been designed and developed.

It starts with an overview of the design concept, in order to form a general impression of the game as well as the main target player.

Following section one, section two introduces the management of development. It includes an overview of the design process, as well as the project timeline. Lists of asset and equipment are also included.

Section three majorly introduces the design of gameplay and art style of Treastory.

Section four talks about the engineering and the output of the game.

3.2. Overview

3.2.1 Concept Overview

- Name: Treastory

Treastory is a blend of word “Treasure” and “History”. It describes the main concept of this game and give a direct message of “find the connection between history and treasure” to the players. Furthermore, the word “treasure” is also a verb., which has the meaning of “cherish”. In this way, Treasure can be construed as “cherish the history”, imply the value of history and appeal to players to attach importance to the history.

- Genre: Indie, Adventure Game, Role-playing Game

Indie: Treastory is created by the author for academic purpose, from design to the programming.

Adventure Game: Treastory is an adventure game designed for single player experiencing a fictional world that brings alive the history of China. “Treastory” focus more on immersive story-telling and interaction design. Historical characters are designed to have distinct personalities. Character development follows emotional growth, rather than powers or abilities that affect gameplay. Assumes the role of an antiquities repairer, player are able to find and pick up several fragments in the game due to the clues they got from the history stories. Repairing a cultural object from the fragments will unlock access to new areas in the game world, and reveal more of the historical stories.

- Theme: History of Emperor Taizu of Song.

The game theme is specified to history in Song Dynasty, an era of complex social organization that brought rise to a rich and diverse social life and culture. The historical person and the stories are actually existed. The narration is based on the real historical events.

- Platform: iOS(Android in process)

- Features:

1. Brand-new perspective of a cultural relics repairer.

Player will go through the role of cultural relics repairer and experience the history by exploration and repairing.

2. Handy and fragmentary playing

Treastory is a tablet game that easy for carrying. Players can start the play from anytime in anywhere, which construct flexible and fragmentary playing style.

- Game Play:

Treastory is a single player tablet game composed by digital figures, narration text, background music and effect sounds. Player use fingers touching

on the screen to interact with several objects in game, experiences the history of Song Dynasty. At present stage, this game will spend approximately one hour. The game play of Treastory will be explained deeply in section 3.4.1.

- Story:

In 2030, due to several disasters, a huge number of cultural objects had been badly destroyed. Fortunately, most of the cultural objects had been scanned to digital data, which means at least the cultural objects could be re-build depending on their digital. However, it still lost several details which needed history acknowledge to find out. In order to save the crystal of human 's cultural, a brand-new project called "Treastory" had been established. By using the technology of simulating specific history in virtual world, repairers could experience the background history of the cultural object to find out the losing details, which could help their repairing work. You, the protagonist of this game, is a new member of "Treastory" Project. You were suggested by your master Fu, who raised you up and teach you the craftsmanship he had inherit form ancestor. Your first mission is to repair a cultural object which is from Song dynasty.

- Target Audience: Treastory is a single-player tablet game. Its target audience is Chinese youths around 12 22 years old. For Chinese youths, they are more likely to be attached to games, especially tablet game. According to the survey, most of them only have 1 2 hours per day to play games. Their gaming time is frag-mental and monitored by parents, which is the reason or the tendency to play games on tablet or smart phone, rather than computer or game console.

In addition, Chinese youths are receptive to new things and willing to learn. To promote the interest of learning history, 12 22-years old is a good line to start.

3.3. Management

3.3.1 Project Timeline

- January – February, 2019 : Theme Decision

Project started with the idea of making a game for arousing history learning interest based on the author's own experience that had been discussed in the previous chapter. The project decided to make Song Dynasty, a symbol of culture, as the main theme of Treastory. Within the long river of Song Dynasty's story, Taizu Song, Zhao Ku'angyi, were chosen to be the main characters.

- March – April, 2019 : Research on Related Works

While the general goal of this project was clear, the approach and the challenge of this research still need to be discussed.

For the purpose of clearing the direction of the project, research question was clear from the studies on related works: Object-based learning approach still works on the arousing interest when the method is in digital.

- May – June, 2019 : Ideation and Paper Prototype Creation

Object Selecting

A decision of which cultural relics within which history as the main topic was required.

In the ideation, the project picked out cultural relics that had been mentioned in the history text book as well as the book of "Chinese History in Cultural Relics" by writing the keywords on the post-it.(Figure 3.1) Regarding the concept of the game, some of them had been eliminated by following principles:

1. The cultural relic is an actual object which is touchable.
2. The cultural relic has possibilities of being repaired.
3. The cultural relic has its history background that can be connected to specific historical events or person.

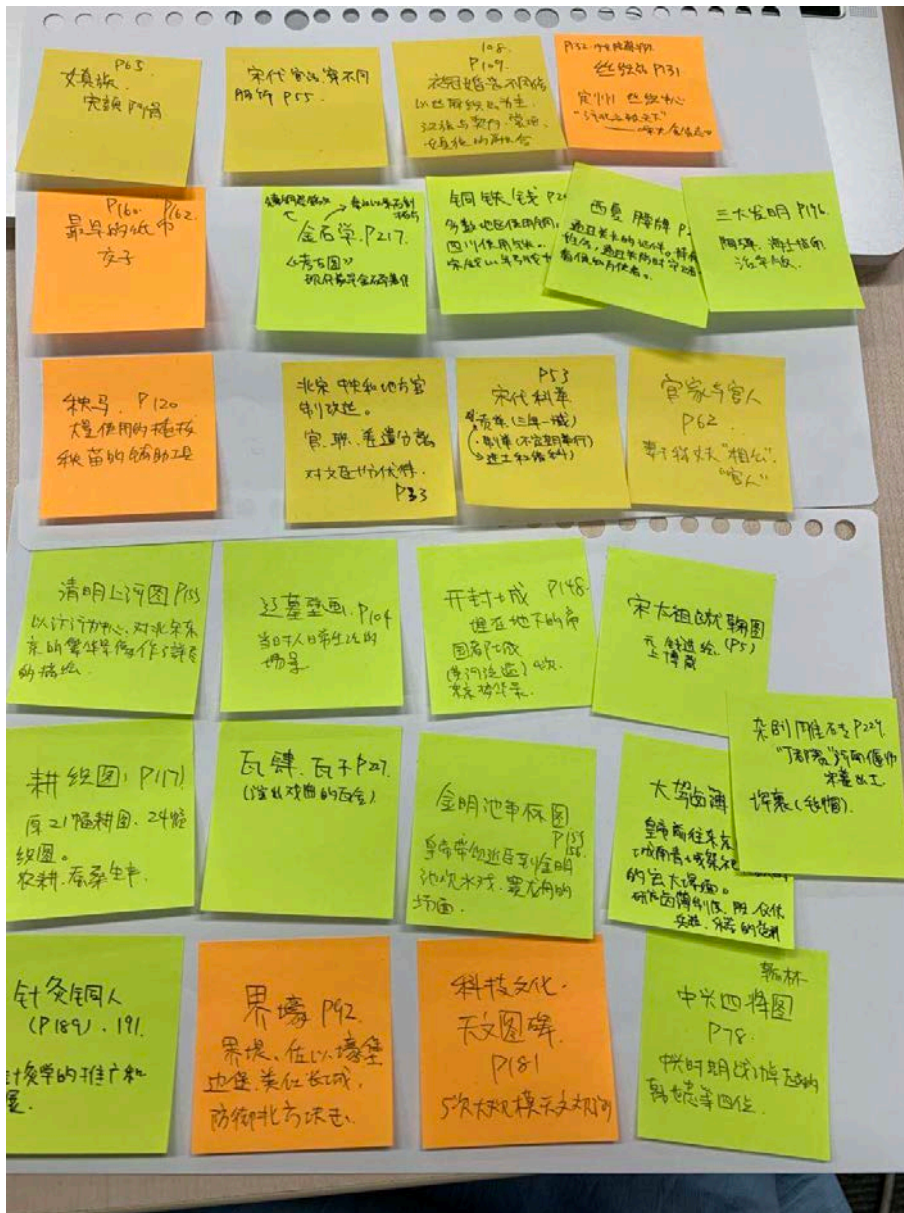


Figure 3.1: Brainstorming of Choosing Objects

Paper Prototype Making

The paper prototype is the very first version of Treastory for taking an overview of the interaction in game. It lays the foundations for the later

interaction design and programming of the digital version.

The paper prototype only has two areas for exploring. It roughly simulates the flow of player experiencing historical events by following the clues in hand, collecting the fragments of object by solving the puzzle. New area will unlock when fragment had been collected. When finish collecting all the fragments from the two areas, player will move to the repairing part. The object would be repaired by putting all the fragments together in order.

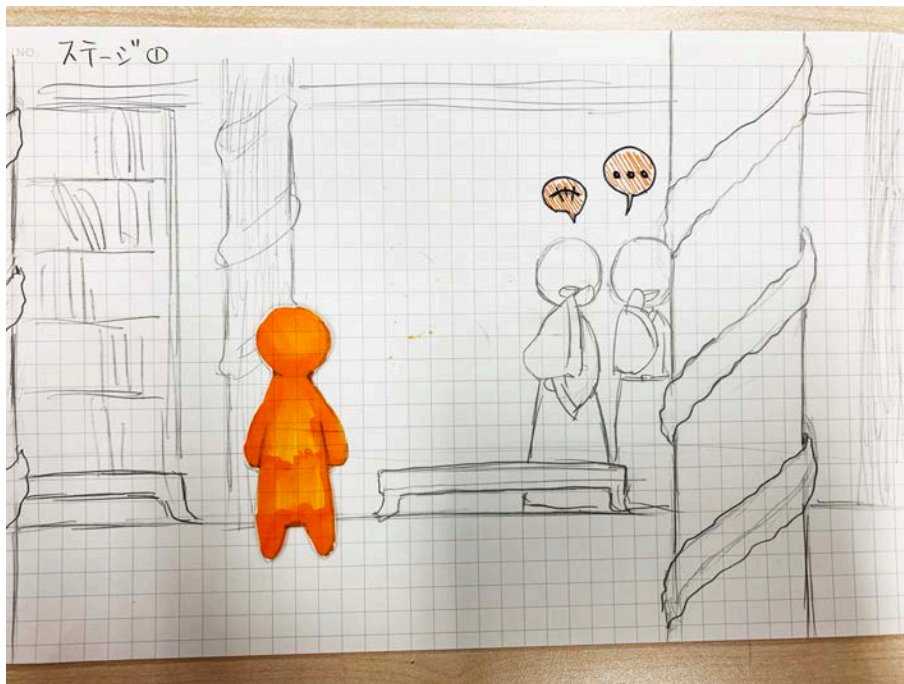


Figure 3.2: Paper Prototype: Area01 Draft

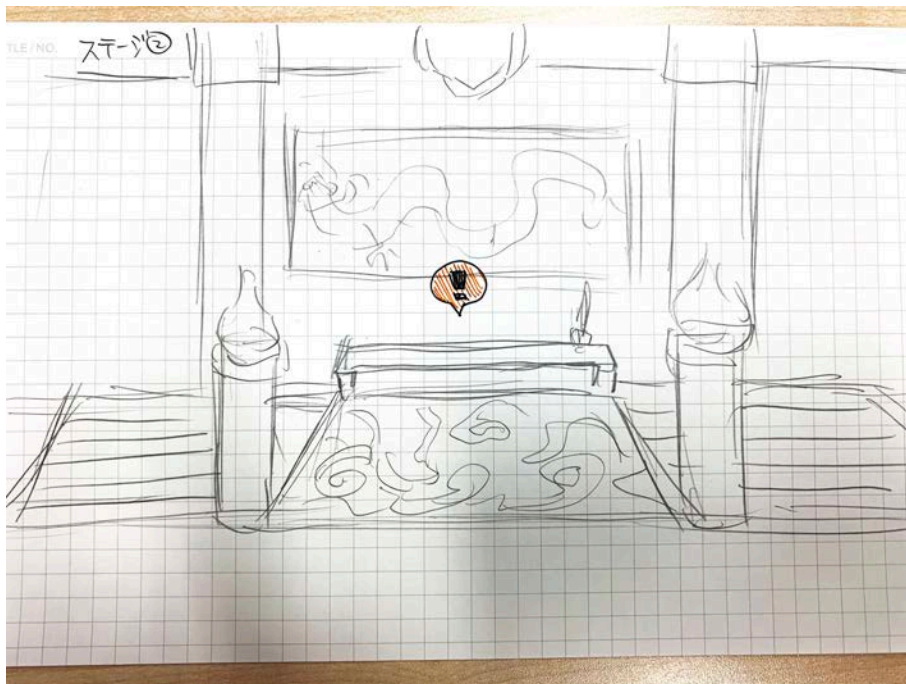


Figure 3.3: Paper Prototype: Area02 Draft

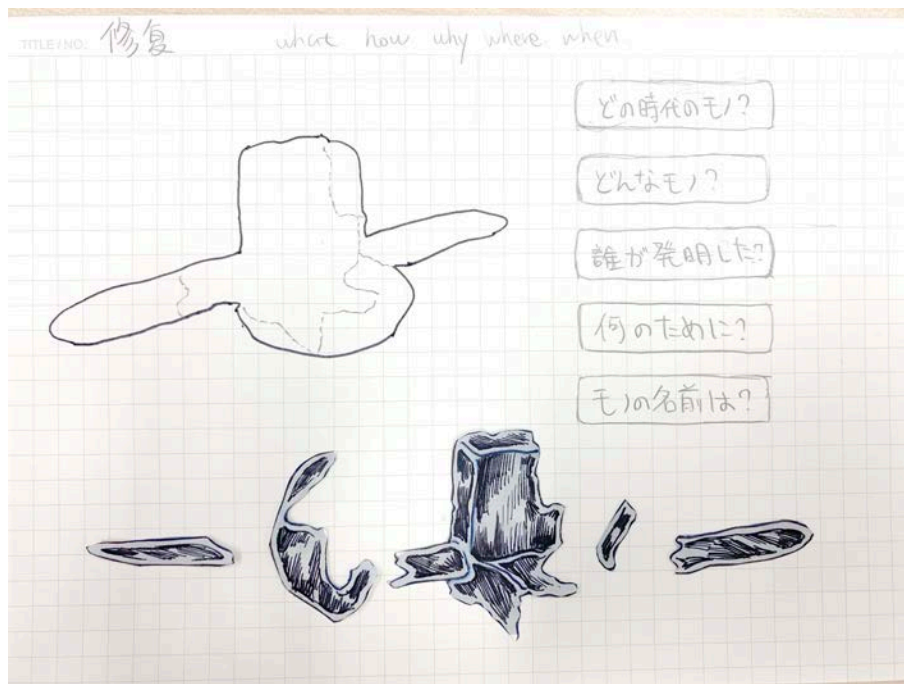


Figure 3.4: Paper Prototype: Cultural Object Repair Scene Draft

Paper Prototype Playtesting

Playtesting is necessary to serve as a wake-up call and force the developer to solve the problems that had been putting off. (Schell 2008) The playtesting of paper prototype was conducted in June, mainly focused on the logicity and functionality.

Since the player's interaction won't trigger any event due to the lack of narrative and programming, the author acted as a game master who reads the lines of the events and makes decisions whether player could get the item or not.

In terms of cultural relics repairing, the participant was excited to have seen the full view of the cultural relics after putting the fragments together. The participant said, "I had no idea how it could be related to the history when it was just a small piece, which brought me a big surprise that I can tell the story now after all of it." Therefore, the game kept the design of collecting

and repairing cultural relics in a form of puzzle to the next version.

On the other hand, the participant said the game flow was lack of challenging, because touching the objects in the game was the only interaction need to be done to achieve the goal. From the observation, most of the time the participant looked confused when thinking of what to do next, which led to the result of player 's less motivation of exploring.

Based on the feedback of the testing, the author redesigned specific parts of the game flow, launched the second prototype of Treastory.

- July – August, 2019 : Art Creation and Beta Version Development

Most of the development was done in Unity, a well established game engine.

- September, 2019 : The First User Test

- October – November , 2019 : Alpha Version Development and The Final User Test

The alpha version of Treastory was constantly giving out for players to test after several improvement depending on many meaningful feedbacks collected.

- December, 2019 : Writing Essay

While there's still many things to be adjusted in the game, it is also important to write down the design process and summarize the feedback received. Writing helps to overview the entire journey of the project.

3.4. Game Design Document

Gameplay Design

The overall game flow design follows a simplified form of Kolb's experiential learning cycle (Kolb 1984), which had mentioned in the previous chapter. To repeat, the model was well-established and highlighted the importance of learning from experience that were widely used to encourage learners' motivation and engagement in object-based learning.

Based on the cycle, the gameplay of Treastory has been designed into four main part (Figure 3.5)

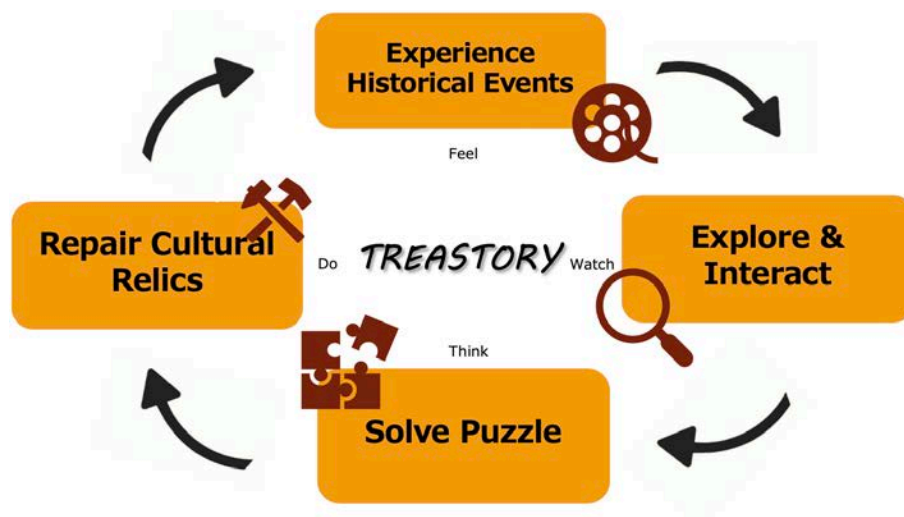


Figure 3.5: Game Play Design Based on Kolb's Experiential Learning Cycle

Firstly experience immersive historical events by reading historical figures' conversations, observing their reactions and feel their feelings.

Secondly, explore and interact with the objects in game. Survey the whole game scene and the conversations to find out clues and connections between the objects.

Thirdly, think deeply and solve the puzzle. Conclude own knowledge and experience to decide what to do and how to solve the present problem.

Finally, repair cultural relics. Trying out what you have learned and experienced.

The entire game flow can be simply shown in the picture below.(Figure 3.6)

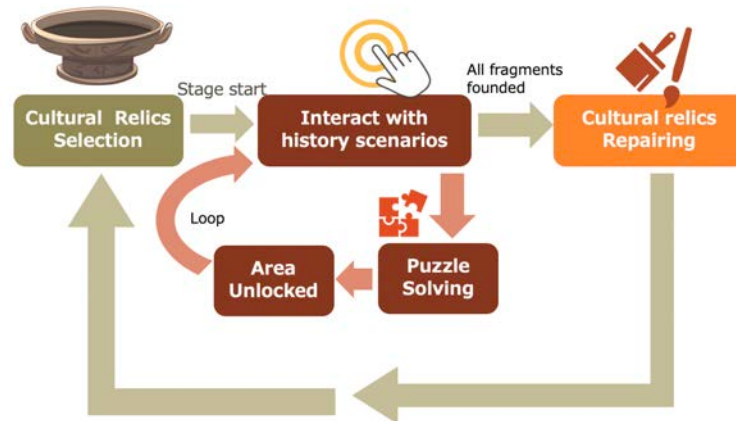


Figure 3.6: Treastory: Game Flow

Cultural Relics Selection

After introducing the game world to player, the first scene player's going to see is the collection room.(Figure 3.7) This is a place for player to overview all their collections of the cultural relics. It is where player's going to start their journey.



Figure 3.7: Treastory: Collection Room

If player click on one of the object in this page, it will open an information page with some details of the object. (Figure 3.7) At the very beginning, if player has not finished repairing , the information here should be limited with numbers of empty place. Player need to complete it by clicking on the start button to begin the stage.



Figure 3.8: Treastory: Collection Room - Object Information Page

Interact with Historical Scenarios

From this part, the game will "send the player to the past", to explore and experience specific history. Many objects such as landmarks, entrance of a house, are designed to have feedback on player's move on it.

The idea of interacting with objects in the game scene was inspired from a game called Ink · Mountains and Mystery(Figure 3.9).



(Source: TapTap Game Introduction)

Figure 3.9: Ink · Mountains and Mystery

Ink, Mountains and Mystery is an adventure game developed by NetEase Games. Using multi-layered, hand-painted 3D models and a unique rendering technology, this game represents a unique artistic conception filled with gorgeous colors and rolling landscapes.¹

Without solving the puzzles setting in the game scene, players are not allowed to move to the next area. Therefore, players have to interact with several objects in the game scene to find out a way. The objects can be a lantern hanging from the eaves(Figure 3.10), a tree in the middle of the lake, or a stone of the mountain.



(Source: TapTap Game Introduction)

Figure 3.10: Ink · Mountains and Mystery Object Using

Ink, Mountains and Mystery inspired us to design an interaction between the

game stage and several objects that can be found in the game, in order to make a connection between cultural relics and historical events as well as figures. The restriction of locking the area until player solved the puzzle has been a good example for Treastory to make it as a motivation, encourage player to continue thinking and playing.

Returning to the subject, feedback of interaction such as a flashback of historical figures' conversation, will sometimes show on the screen. Each conversation links to a puzzle in the stage.

Puzzle solving is essential in adventure game design. Particularly in Treastory, puzzle solving aims to invoke player's independent thinking and a place for one to use their experience, what they had learned. Player is required to capture important messages from the conversation (Figure 3.11)and think about how it connect to the specific puzzle solving.



Figure 3.11: Treastory: Clues in Historical Events

Except the clues in the historical events, player is allowed to use various objects, such as the landmark of Chenqiao Bridge(Figure 3.12),that can found from the exploration. It looks like a sticker which can be moved by players' finger, and fit in the empty place on the screen.(Figure 3.13)



Figure 3.12: Treastory: Getting Pieces



Figure 3.13: Treastory: Putting Object to the Right Place

By returning it to the right place(Figure 3.14), a flashback of historical events will be unlocked to replay. The reputations move in cycles until player solved all

the puzzles and had watched all the historical events. It leads player to reach the goal of collecting the rest of cultural relics fragment.



Figure 3.14: Treastory: Flashback of Historical Events

Cultural relics Repairing

As the last part, player will repair the relics by using proper tools and their knowledge from the previous experience. (Figure 3.15). For example, some figure's face is a little vague in the fragments. Based on the knowledge and information player gain from previous experience, player may know the figure's name and how he should look like. The repairing process emphasizes the importance of individual thinking through unlimited trial and error. Even player make wrong decision in the repairing, the game system will give them a feedback of where player got mistake.



Figure 3.15: Treastory: Repair the Cultural Relics

After finished repairing, if player goes back to the collection room, player will find that the fragment had changed into a complete object(Figure 3.16), and the information of the cultural relics had been completed(Figure 3.17).



Figure 3.16: Treastory: Complete Object in Collection Room



Figure 3.17: Treastory: Complete Information of Cultural Relics

3.4.1 Art Design

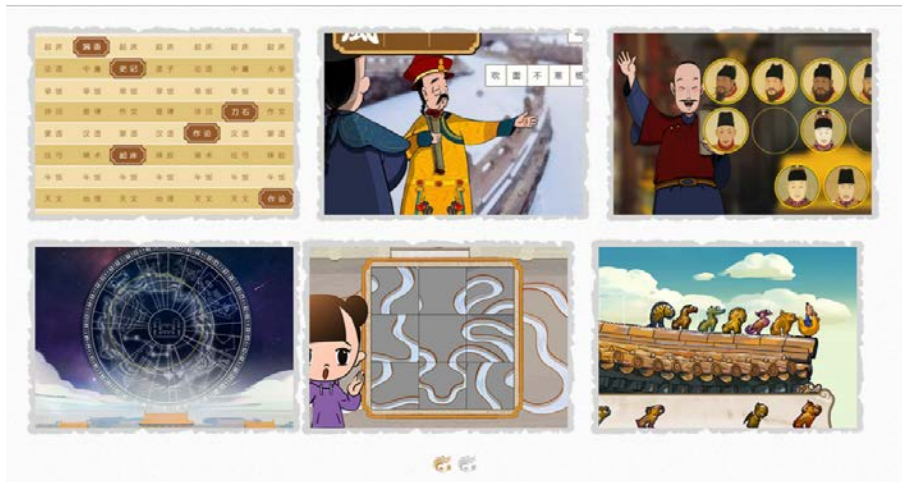
The art design stands for an important role that gives player a direct impression of the game. In details, Treastory as a digital game, is combined by various assets. From the previous research, it is notable that the level of engagement has a huge power of encouraging learners' motivation. Therefore, in this session, main features that are directly linked to creating engaged game experience will be mainly introduced.

Inspiration of Art Design

Mini Games on The Palace Museum Website

For the purpose of attracting youth's attention on Chinese culture, The Palace Museum published several mini website games on their homepage. ²(Figure 3.18)

They use relatively high saturation color in game elements and simplify the characters in to a cartoon style, which makes the games full of childness and fun. It had a big impact on raising interest of youths to click and open the games, hence some design ideas as using relatively high saturation color and draw characters in cartoon style are represented in Treastory's art.



(Source: The Palace Museum Website)

Figure 3.18: Mini Games on The Palace Museum Website

Color Theme

Based on the previous discussion, Treastory uses bright colors instead of using dark color that are generally used in historical drama or documentaries. In order to cater to the story background, the color theme in Treastory are decided into two theme: history and future.

On the history side, colors like yellow and brown are essential for building a sense of history. (Figure 3.19) Red is a symbol of love, enthusiasm, as well as the impression of China, which can achieve the goal of enhance players' motivation and excitement.



Figure 3.19: Color of History

Future side is different from history that it uses series of blue(Figure 3.20), which is a very cold color compared with the warm color of history side. It mainly emphasis the sense of immersion that showing a signal of being in the future based on the story background.

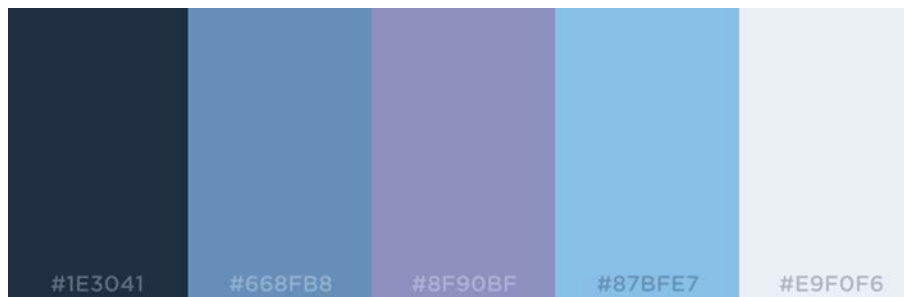


Figure 3.20: Color of technology, future

Character

There are three types of characters in Treastory: Player character, non player character in real and non player character in historical stories.

- P : Player Controlled Character

The protagonist of this game is a new repairer to the project “Treastory”. In pursuit of immersive experience, the protagonist’s name is unknown. Instead of calling the name, characters in game use ”you” to call the player. For the

sake of expression, in this research we call “P” as the name of the character that player controls.

Since this game is designed for playing mostly in first person view, such as during the conversation with other characters. Though player cannot see himself for the most of the time, a sprite of character is essential for the purpose of showing the position of player standing that can help player easily explore the stage.

- Guide: Non Player Character in Real

Guide is a female character who is a role of supporting player to understand the background and what to do in the game. Her clothing style is similar to modern girls, as well as the color series of blue emphasis that she’s a character from real in game, not from the historical stories.



Figure 3.21: Guide: Character Portrait

- Historical Figures: Non Player Character in History

According to the previous discussion, one of the reason that young Chinese are unable to memorize history knowledge was that historical person all

looked similar in the pictures. Therefore, Treastory abstracts those figures into cartoon styles in order to enhance the characteristic of each character to make them look special and impressive. In addition, various clothing and characterized color design also works on the distinguish characters in game. In the earlier version of character design(Figure 3.22), character design were too simple that it's hard to tell the difference when there were more characters. Plus, the bright yellow brought an uncomfortable feeling due to its impression of alert, for example the color of Taizu's cloth.



Figure 3.22: Earlier Verison of Historical Character Design

As a consequence, the project made an attempt on adjusting the art of the characters. In the second version(Figure 3.23), the performance of the characters are more close to the reality. The second version avoids using too much bright color of yellow .



Figure 3.23: Second Version of Historical Character Design

Character 's Emotional Expression

The express of character 's emotion is exaggeration in Treastory aims to build a better understanding of historical figure's feelings for player. On the other hand, it also effects on enhancing the characteristic of each.



Figure 3.24: Character 's Emotional Expression

Stage

Based on level design, environment narrative has to be added to the levels. Jethro Jongeneel (Jongeneel 2013), a game designer, believes that environment narrative has its power of describing the details of the world, guiding the objectives or rewards of players and enhancing the sense of immersion.

The exploration part of Treastory is a horizontal scrolling game play which requires a long-length sprite of the game stage.



Figure 3.25: Stage design, Area 01



Figure 3.26: Stage design, Area 02

Pop-up

An adventure without hints may cause several problems, such as player will easily get confused on what to do next. For the purpose of solving this problem, Treastory use pop-ups in game to help player know what to do next as well as distinguish which is already checked and which is not.(Figure 3.27)

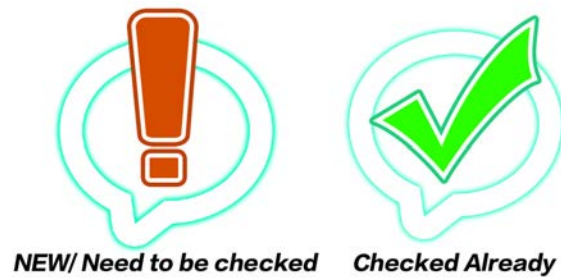


Figure 3.27: Pop-up design

3.5. The First User Test at Shanghai Jingye High School

The first user test was conducted in Shanghai Jingye High School in September 2019. The evaluation picked up 26 girls and 26 boys from different class, and the participants were divided into two groups: Group A and Group B.



Figure 3.28: Group Divided by Drawing

Each group conducts respective assignments as following:

Group A: Read a material of Taizu Song ' s history.

Group B: Play Treastory.

The purpose of the first user test is to know current situation of history learning in school, compare 2 approaches of history learning ' s result, analyze and find the difference. The most important goal is to recognize problems in game design.

3.5.1 Process of Testing

1.Pre-questionnaire:

Before the game started, the instructor would give a 5 minute introduction of this test. Both groups were required to answer the pre-questionnaire based on the following topic.

·Gender ·Current interest ·Level of academic achievement ·Favorite book/game genre ·Experience of history-related reading/game ·Frequency of reading/playing game · Rating on a 0-10 scale of attitudes on history

2.Testing

The time setting was 30 minutes. Every participants started the testing at the same time, but they could finish at anytime depends on personal differences in speed. The participants were allowed to raise their hands for asking for help when there was any trouble.

3.Post-questionnaire:

After the testing, both A and B groups were required to write a post-questionnaire which included these questions about the history of Taizu Song:

- Historical Person appeared in the reading material/game
- Historical landmarks appeared in the reading material/game
- Historical events appeared in the reading material/game

They were asked to write down as much as possible that they could recall from the experience. Plus, they are not allowed to review the reading materials or the game while writing down the answers since all the materials returns to the instructor. These are for measuring the memory participants engaged in the experience.

Additionally, both groups are required to describe their reading or game experience in the following aspects:

- The level of curiosity
- The level of relaxation
- The level of concentration

These are used for measuring how the participants engaged in the experience.

The entire testing process was recorded in hand-writing notes to memorize some noteworthy points from the testing.

Table 3.1: Schedule of the First User Test

Time	Duration	Activity	Facilitator
13:00	1 min	Greeting and Introduction	R
	2 min	Help Lining students draw for dividing groups	T
	2 min	Guide students move to each group's classroom	T
13:05	1 min	Hand out Pre-questionnaire and materials	T
13:05	4 min	Introduce the flow, attention	R
13:10	30 min	Collect Pre-questionnaire	T
		Observe students' behavior in testing	R
		Takes photo and video	R
13:40	10 min	Collect materials, hand out post-questionnaire	T
		Check the number of all the materials	R
13:50	5 min	Collect post-questionnaire	TR
		Closing	TR

3.5.2 Equipment and Materials

Since each student has to start the game testing at the same time, at least 26 tablet are essential for Group B's test. Considering trouble might occur due to the large number of devices, we created a form to manage and record information of each.

Table 3.2: Equipment List

No	Model	iOS version	Adapter	Identifier
1	MLMN2CH/A	9.3.5	o	aka
2	MLYY2LL/A	12.4.1	o	Jinc
3	MPGT2CH/A	10.3.3	o	Sum
4	MD789CH/A	11.1	o	Lina1
5	MC980CH/A	9.3.5	o	Lina2
6	MGGQ2CH/A	12.2	o	Lina3
7	MD528ZP/A	9.3.5	o	Lai
8	ME280CH/A	11.2.1	o	Jinl
9	MD531CH/A	9.3.5	o	Hongq
10	MK6L2ZP/A	12.4.1	x	Haoh
11	MC769X/A	9.3.5	x	Dabo1
12	MC979CH/A	9.3.5	x	Dabo2
13	MC979CH/A	9.3.5	x	Qin
14	MGL12CH/A	9.2.1	o	Mao
15	ME279CH/A	12.1.1	o	Si1
16	MD328LL/A	9.3.5	o	Si2
17	MC769CH/A	9.3.5	x	Song1
18	MD329LL/A	9.3.5	o	Song2
19	ME276CH/A	9.3.5	o	Wangk1
20	ME279ZP/A	12.3.1	x	Wangk2
21	MK9Q2CH/A	12.4.1	o	Wangk3
22	MD533ZP/A	9.3.5	x	Wangk5
23	MC979CH/A	9.3.5	x	Wangk6
24	MD785J/A	12.4.1	x	Wangk7
25	MC769CH/A	9.3.5	x	Wangk8
26	MLMQ2CH/A	12.4.1	x	Wangk9

The reading material in Group A's testing, of Taizu Song's history were written based on high-school history text book. It includes not only text but various figures related to specific historical events.

3.5.3 Result: Observations

3.5.4 Observation: Group A

Students of Group A had various habits in reading. Most of them read the material with pens in hand, circled or underlined several keywords. A small number of students used fingers following their eye movement.

Group A students were quiet after the testing. They did not discuss much with others. There was one girl who went to the Group B 's classroom and shacked shoulders of her friend, who 's in Group B 's testing. When the author asked for the reason, she answered that "I felt so jealous on Group A that they 're having fun in games while I was almost fall asleep in the other classroom."



Figure 3.29: Experiment of Group A

3.5.5 Observation: Group B

Students from Group B were obviously excited when being told that they 're going to play a game in the testing. Most of the students had shown great curiosity in interacting with the game objects, especially boys who are used to playing tablet

game. Some of them finished playing game hortly afte the game started, and some of them was playing slowly until the time limit.

After the testing, few students had kept discussing their game experience. Through the interview of those students, “ I have seen the picture several times in text book, but I did not know that there ’ s actually a connection between it and the historical story. I wondered if I was the only person who just knew it? ” , “ I took longer time than others on finding the fragments of the cultural relics. It makes me think of whether it means I ’ m lack of knowledge in history. ”



Figure 3.30: Experiment of Group B



Figure 3.31: Experiment of Group B

3.5.6 Result: Data Analysis

This section discusses the difference between the two groups in the result of curiosity, concentration and enjoyment's rating. In addition, it includes some answers of open-ended questions for the purpose of examining the factors that affect the results.

From the rating of "I'm very curious in history and willing to know more", Group B(Playing Game) rates higher level of curiosity than Group A(Reading).

As the bar graph below, the majority of participants from group A showed a lower rating on the curiosity. In contrast, the participants from group B gave positive answers except one rated "1". As well as, three participants rated "5" which is a neutral answer that was to tell their attitude.

Q: I'm very curious in history and will to know more

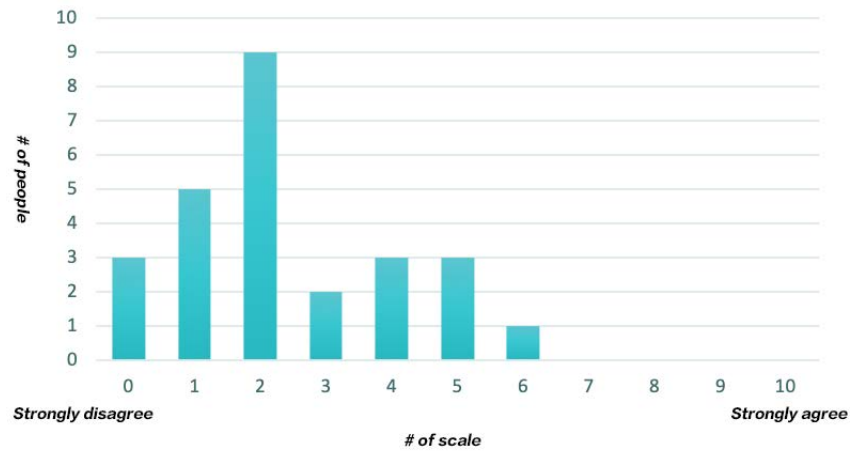


Figure 3.32: Group A Curiosity Rating

Q: I'm very curious in history and will to know more

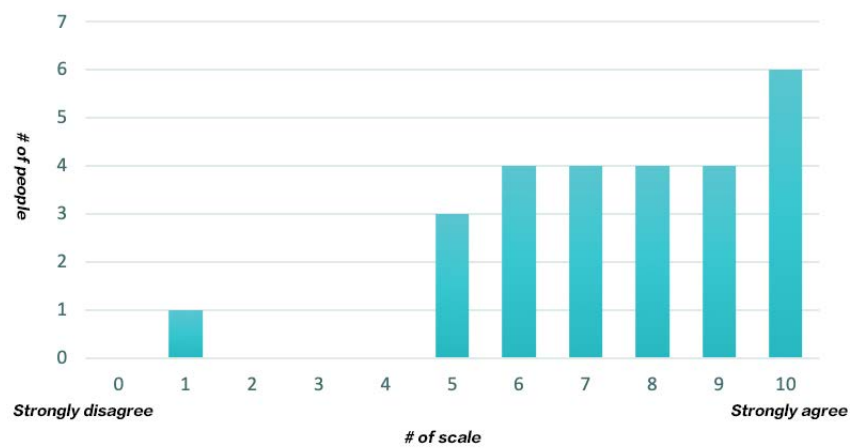


Figure 3.33: Group B Curiosity Rating

There are significant differences between two groups in the rating of concentration. Group B rated higher level of concentration while playing game than group A's experience of reading.

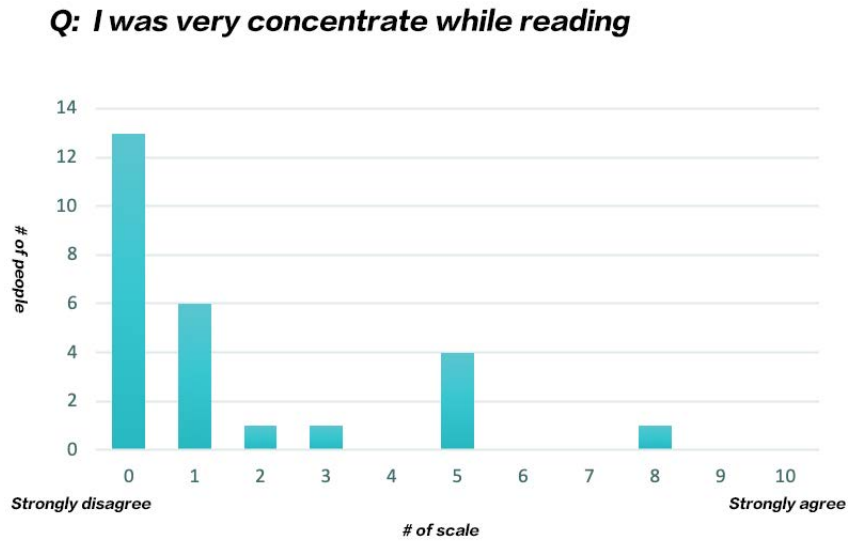


Figure 3.34: Group A Concentration Rating

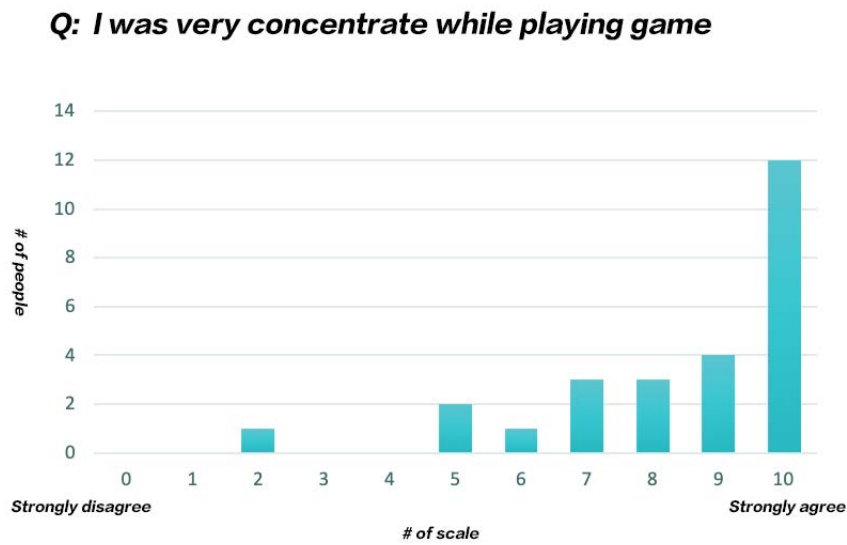


Figure 3.35: Group B Concentration Rating

However, different from the previous rating, the two groups showed a similar result in the rating of enjoyment level. Even though the participants of group A rated low grades on curiosity and concentration, they still felt the testing was enjoyable. This is an interesting result that can go into a deeper discussion of why group A were enjoyed in reading even they had less concentration and curiosity.

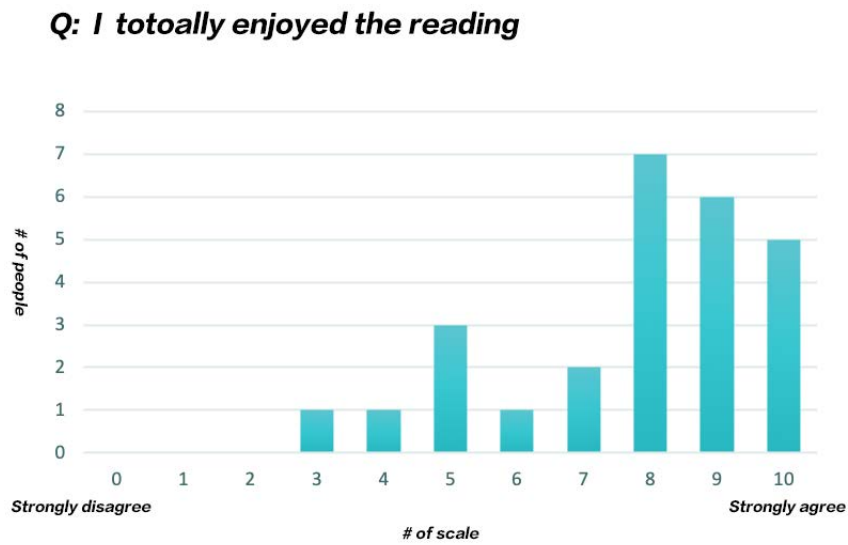


Figure 3.36: Group A Enjoyment Rating

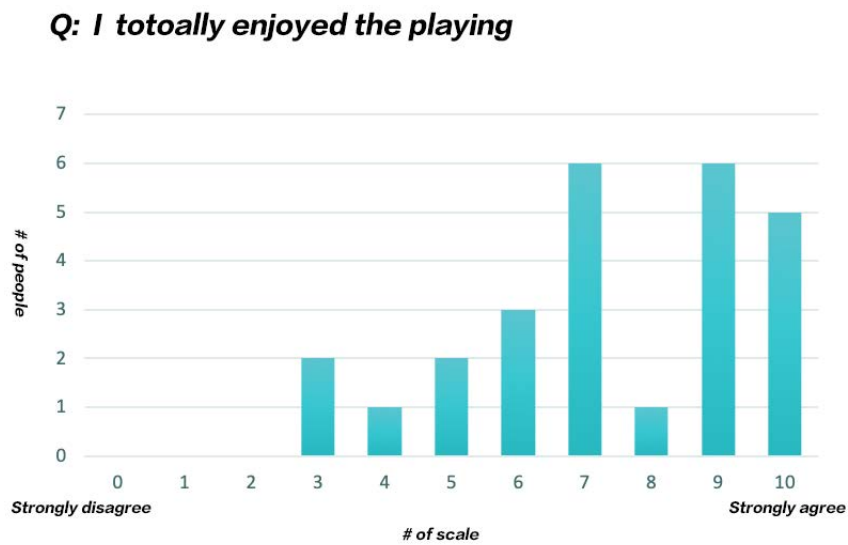


Figure 3.37: Group B Enjoyment Rating

Based on the open-ended answers of "What interests you most in the reading?", many participants answered "the story does not only introduce Taizu Song as an emperor, but also the side of him as a human with rigorous and meticulous mind", "The reason Taizu Song chose this strange way to become the emperor was because he imitated the previous emperor's act", "the description of the cultural relics and the rhetorical questions of how it connects to the Taizu Song's story".

These answers can be summarized into four aspects. Firstly, a multiple perspectives of historical person's characteristics. Secondly, accessible cause and effect of historical events. Thirdly, intriguing rhetorical questions. Finally, the connection of cultural relics and historical person.

3.5.7 Result: Game Design Related Discussion

Depends on the previous discussion, it is obvious that many problems exist in beta version which influenced the engagement of game experience:

- Too much narrative in Guide's conversation As a main factor of low engagement issue, too much narrative in the conversations between player and Guide leads to player's mood of impatience. The narrative was aimed to build player's impression of the entire whole view of the game and give hints of solving the puzzles in game. However it ends up in disturbing player's decision thinking that brings a bad influence on player's game experience.
- Low Sense of Accomplishment The fact that the exploration and repairing of cultural relics was insufficiently challenging, player shows a lack of accomplishment after they finish the game. It result in the low motivation of player to continue the game.

3.5.8 Summary

Overall, Group B rate higher enjoyment and curiosity in game play, but lower understanding compared with Group A. It proved that the gameplay was attractive to the participants. Furthermore, the first user test of beta version revealed many problems and provided important data for the improvement of Treastory.

Although the higher rating of curiosity can be considered as an evidence that Treastory aroused the participants' interest in history, the evaluation without follow-up survey is less rigorous. A follow-up survey is essential for investigating whether the participants actually searched for further knowledge or not after the test.

Based on the findings and feedback, alpha version of the game was developed, as well as the final user test.

Notes

Chapter 4

Evaluation

4.1. Method

In order to ensure the authentic of the results, the research chose deep interview and follow-up survey as the main method of evaluation, as well as observation and questionnaire.

It was clear that Treastory had aroused young Chinese's curiosity of history learning, which had been shown from the previous test. However, flaws of the evaluation and game design issues are much in evidence. Following are the reasons of choosing the methods mentioned above.

Firstly, measure participants curiosity only base on questionnaire and their words was less rigorous, due to the subjectivity of their answers. Indeed, one possibility is that they might have read researchers' intention of the test, which could have affected on their decision of what kind of words to use. By adding deep interview and follow-up survey to the test, the contradiction between participants' representation and reaction can be clear.

Secondly, open-ended interview can effectively help in capturing in-depth information, such as own experiences, feelings or preference, which cannot see only from data or observation. Interviews are particularly useful for getting the story behind a participant 's experiences. The interviewer can pursue in-depth information around the topic. (McNamara 2006)Participants in the final user test are various in ages and backgrounds, which make the test include diverse situations of learning history. In this case, deep interview is essential to know well about each participant's characteristic and habits, in order to achieve the goal of seeing the changes by comparing before and after.

Thirdly, the researcher can change questions flexibly based on the response. By focusing certain respondents to questionnaires, researcher can further investigate

their responses and extract more details.

The main goal of this evaluation is firstly to see whether Treastory actually invoke participants' curiosity of Chinese history, secondly to follow up and observe the changes of participants after the test. Finally, how object works in the test and how they affect on participants' curiosity in history.

To achieve the goal, the final user test will mainly analyze and collect data of:

- Observed results of participants' behaviors and reactions when playing game
- Self rating level of:
 - Curiosity of History Learning
 - Curiosity of Cultural Relics
 - Enjoyment of Playing
 - Positive outlook of history
 - Individual Expansive Learning
 - Understanding
- Results of follow-up survey

4.2. Treastory: Alpha Version

As previous mentioned in the timeline, the user test of beta version revealed many problems of game design. In order to solve the problems, an alpha version of the game had been developed for the final user test.

Bellows are the improvements based on feedbacks that were collected from beta version's user test:

1. Add Background Music (BGM) Background music has been put into each

scene of the game in order to enhance the immersion of playing. In the previous test, several students commented that they're easily attracted by people around them. Also some of them said they prefer to play game with music, or they couldn't focus on game. Therefore, adding music to game will hopefully solve the problem of being distracted. Its power of putting players into the situation

and moving one's emotions is considerable effective on building a better game experience.

2. Reducing The Amount of Characters' narrative Based on the feedback of

“ Reading bunch of lines had made me become impatient ” , final version deletes a large number of lines, especially the conversation with GUIDE. In addition, the reducing can considered to give space for players to think independently and invoke deep consideration.

3. New System: Exhibition Gallery All the cultural relics that player had

repaired in game will be displayed in the exhibition gallery scene. This is a system designed for giving player sense of accomplishment. It's a latent feedback to player's performance of gameplay. The more player repaired, the more objects can be used for decorating, which motivate player to experience more in the game and complete the rest.

4.3. Final User Test

Final user test was conducted in November 2019, involved six participants from various background.

Two of them were one of the participants of the first user test. These participants have already experienced the beta version play testing, so that they are more likely to give feedback related to the improvement part.

4.3.1 Equipment

The final user test use tablet as platform of Treastory: Alpha version, use computer for video call in order to connect participants who're far from other cities.

Following is the list of the equipment had been used in the test.

Table 4.1: Participant List of Final User Test

Name	Age	Place of birth	Gender	Previous Attendance
A	15	Shanghai	Female	Yes
B	15	Shanghai	Male	Yes
C	15	Shenzhen	Female	No
D	14	Sichuan	Male	No
E	19	Hangzhou	Male	No
F	22	Beijing	Female	No

Table 4.2: Equipment List of Final User Test

Equipment	OS version	Others
Dell Inspiron 1500	windows10	Develope
MacBook Pro	10.14.6	Release data
iPad Pro	9.3.5	Game test

4.3.2 Pre-questionnaire

Through the data from pre-questionnaire, there were several basic information can be found:

- A and C have negative attitude on learning history than others

In the question "Q1:Are you interest in history?" and "Q2:Do you like learning history?", only A and C answered "Absolutely no" to both. By way of contrast, B answered "Yes" in Q1, but "Absolutely No" in Q2, which means that B do have some interest at least in history itself though he hates learning of it. However, A and C gave negative perspective on both. Their feedbacks can be extremely important in this research.

- B, C, F are more experienced in game playing than others.

According to the question of "How often do you play games?", B, C, F were the only three participants that answered playing games over 3 hours per day. From the data, we can see that they play games very often and might have more professional opinion on the game design.

4.4. Result

Overall, participants had shown further curiosity and positive attitudes of approaching Chinese history learning. They enjoyed the process of repairing the cultural relics and recognized the lack of knowledge by themselves. Some of the participants started individual expansive learning in two weeks after the test, which is notable as a symbol of curiosity arousing.

4.4.1 Positive Perspective Changing Lead to Individual Expansive Learning

As a particular example, participant A is a 15 years old girl born in Shanghai. She's an outgoing, bright and sociable girl that is very popular in her class and communities. Her hobby is dance and music, seldom play games except music games. She had negative impression in learning history. The reason was that she thought history is useless in daily life and the teaching was boring and hard to understand or memorize. When I asked her about who's her favorite historical figure, she answered nothing but: "How could I tell the difference between those super similar face?"

By comparing her rating date before and after the test, we found her result of the rating in the enjoyment level was lower than before, which looks contradict with other ratings. Based on this finding, we asked her about the reason by asking several in-deep questions. She said that she didn't really enjoyed because she got stuck in puzzle solving due to her impatient behavior when reading the text in game.

As a matter of fact, A had shown an impatient behavior, for instance, clicking the screen fast and frequently to skip the text at the beginning of the test. Therefore, it was notable that she slowed down the speed and became more patient later. She said that it was because she realized there's a need of using the clues that are hiding in the conversations to solve the puzzle. During the test, she asked me if she could read those conversation again. However, there's no such system in game.

Even she had rated lower curiosity, she was the one who changed the most after the test. In the follow-up survey, we found that she was playing a history-related

game on PC. During the two weeks after the test, she went to her friend who can be called as a "gamer", asked about suggestions of games that are related to history. She said game as a new platform for her to gain knowledge make her changed her impression of history to positive side.

4.4.2 Self-consciousness and Opening Up New Way of Further Chinese History Learning

Another particular example, participant E is a boy born in Hangzhou. He has great confidence in history learning, which can be proved by his high grade in history subject's test. He enjoyed teaching his classmates, helping with their history homework. In his rating result, he rated lower understanding after the text, and his individual expansive learning level didn't change. We asked several questions based on this result. From his comment, he rated lower understanding didn't mean that the content of the game was hard to understand. It was actually because he realized his knowledge of history mostly relied on his memory, not understanding. He said there's more to learn from not only text book, but also actual historical objects. He mentioned about his further understanding of Zhao Ku'angyin's relationship and his reason of dismissing his people's military hierarchy through the exploration in the artwork.

Others like participant B said,"I think my knowledge of history was not enough for me to understand the cause and effect. The game made me realized it and did helped a lot." also mentioned the effect of leading self-consciousness. Combining other participants' comments, we can see that the activities around cultural relics had expended the learning that usually won't be written in text books. Process of observing and solving the puzzles had successfully led participant's independent thinking, helped them understand the cause and effect of the historical events and made everything reasonable. It opened up a new and easy-approached way of learning history for young Chinese.

4.4.3 Spread Knowledge and Communication

Another finding in E's follow-up survey was that he found out that using object can be an efficient way to share his experience and knowledge of history. Considering

his willing to share and teach his friends of history, he had usually thought of how he could help with his friends who're not good at memorize to have a better understanding. In the two weeks after the test, he asked his friend to go visit museum together. He tried not to just talked about history, but describe the connection between the exhibits and its historical background. He's happy to see his friend was curious about the story and remembered the knowledge more than usual. When we asked him "what will you do if your friend do not go to the museum and prefer to study alone?", he answered that actually there's one in his class and honestly didn't know how he could approach and help with the classmate. He said he might find a similar game like "Treastory" and suggest to the classmate, and see if the classmate would have interest to start learning with the objects.

Depend on his answer, we asked another question in detail about his reason of considering object as a good approach for him to share his knowledge. In his opinion, cultural relics as an actual object, visualize perplexing knowledge of history and make it simple. Different from the text, object can attract people's attention easily and directly. He said it was obvious that boys always acted exciting around the historical weapons and cloths. Most of the time they won't being moved by the same content but in textual form. After he tried to use object as the new approach of teaching history, he found that object can be easily discussed and shared, which can help him make topic on it.

4.4.4 Activities around Cultural Relics Invoked Curiosity of History

Many participants had answered that the repairing of cultural relics was the most attractive experience in the game, which invoked their curiosity of willing to know more about its history background.

Participant F, a girl from Beijing who plays game often, said that cultural relics repairing has been introduced in many documentaries, but it 's still amazing for her to actually experience it in a game. She said it's a precious activity which can not usually be experienced in daily life. She said that Treastory might be an ubiquitous history game if it removed the part of cultural relics repairing, and

she might won't be curious about it. Repairing the cultural relics made her feel a sense of accomplishment, which was her best motivation to continue the game.

Participant B had shared similar feeling on the effect of cultural relics in game. In the follow-up survey, he said he couldn't help to think about how those objects would have a connection to some historical stories when he saw them in documentaries or drama. When we asked him whether he recalled the knowledge he learned in the game when he saw the object, he answered "No". Later, he explained that he didn't remember the details of the events, but the first thing came to his mind when he saw the object, was the name of Zhao Ku'angyin. He described that this feeling was similar to sometimes he could recall a person's memory by a music he had listened with that person. B said, "It's hard to say that I'm curious about history now. Maybe I'm just interested in that object, not the history itself. But it actually made me care more about historical stories."

4.4.5 Game Difficulty Can be Considered as an Important Influence-factor of Curiosity

Many participants mentioned about the difficulty of the game. Those who were well experienced of playing game thought the current difficulty was lack of challenge. As an example, participant C, a girl from Shenzhen, said she prefer to experience higher level puzzles because the current level was too easy that she didn't really need the clues from the conversations. Others like F also mentioned that she paid too much attention on the puzzles, since she solved them by utilize her own experiences of other games instead of using the clues. She suggested that it might be good to make cultural relics repairing tips as a part of the puzzle.

It was notable from the result that participant who do not play puzzle game often rated higher level of curiosity. Due to participants comments, game difficulty can be considered as an important influence-factor of curiosity. The issue of how to build a better balance to cater to various group of young Chinese is essential to be discussed and solved.

4.5. Summary

As a result, Treastory has received a positive outcome in terms of connecting cultural relics and history. It successfully aroused young Chinese's curiosity in Chinese history, activated attitude of learning history, and provoked motivation of individual expensive learning. The evaluation also proved that Object-based learning in digital form can consistently exert positive effects on encouragement.

The good points of the game design are highlighted as well as the shortcoming. The game difficulty of Treastory was not suitable for all the groups of young Chinese, and the repairing part was lack of professional knowledge. Although these problems need to be considered deeply, generally the experiment provided useful data and feedback that could apply to future works.

Chapter 5

Conclusion

5.1. Conclusion:Proof of Concept

From an idea to complete alpha version of game, the entire design process of Treastory is a long journey exploring the possibilities of applying object-based learning approach in digital game and making a connection between cultural relics and history. The making has experienced brainstorming, prototyping, countless trial and error, and testings. The feedback and advice from the testing were very precious and meaning for improving the game design.

After playing Treastory, many youth Chinese let go of the negative perspectives on learning Chinese history and turning into a self-regulated learning cycle, which proved that Treastory had met the expectations of this project that arousing young Chinese's curiosity and generate better experience of learning history via game design.

In the aspect of object-based learning in digital form, the testing shows a positive result that object-based learning can consistently exert effects on encouraging learners. In addition, learners are able to have unrestricted behavior in try and error of the objects. Furthermore, they can start the experience at any time and any place they prefer with a handy device.

In the aspect of game design, the mechanisms of game had be designed and redesigned time after time based on the feedback acquired from multiple testings. The creation kept following the principle of "create an immersive experience for young players that can invoke curiosity". As a result, the high level of engagement and enjoyment had shown that youths were satisfied with the gameplay, storytelling and the artistic expression.

To sum up, Treastory is a single player game designed for Chinese youth that provides an immerse experience of learning history from a cultural relics repairer's

aspect. The research had showed that it is indeed essential to explore a innovative way for youths to firstly generate their curiosity in history that related to their enjoyment and self-regulated learning. The design process of Treastory can be an valuable case for educators and developers to discuss about new method of learning history and the potentialities of cultural relics.

5.2. Limitation

Bellows are some limitation had been found from the result of the test:

1. Untouchable Cultural relics in game.

Although the attempt of applying object-based learning in digital form may be succeed according to the data collect from the test, the disadvantage that losing sense of touching and smelling still left a problem of low stereoscopic.

2. Restricted scope of test groups

For the first user test of beta version, all the testers are from Shanghai and studying in the same school. It may leave a lack of randomness in sampling, as well as the second user test. Factors, for example regional difference of education level might be an important point to be discussed.

5.3. Future Plan

For further research, the game can be improved in the following aspects.

Expansion of Platform

The platform is planned to be transplanted to mobile devices as well as PC. Interviews indicate that although youths use tablet most, some of them have trouble that they share the tablet with their family which causes the lack of time for using.

Depends of development of technology, Treastory may hopefully transplanted to VR device. VR device is prospective to have an expansion of sense of touching in the future, which is expected to not only enhance the immersion, also remedy a defect of object-based learning in digital that previous mentioned.

Expansion of user groups

The test has proved that the attempt was successful to the young Chinese, especially middle school students. However, according to the questionnaire in the very beginning, the lack of interest of history learning issue does not only exist among young Chinese. In fact, groups outside the scope of the main audience are worthy to be discussed as well. Those may stand on roles of content creators who has strong impact on spreading knowledge and leading the way of social opinion. In the future, the continuation of the project may investigate the expansion of user groups. for even younger or elder users.

Level Design Improvement

As previous mentioned, the difficulty of game is considered as an essential factor of motivating player. The game difficulty of Treastory was limited in group of beginners who seldom play games. In the future, this research will continue exploring it and consider about separating the difficulties from beginner to expert.

Modularize the Design Process for educators The development of Treastory is no doubt difficult for people who hasn't experienced digital game making. In order to help educators to create further contents easily, this research plans to modularize the design process and make it into a tool, which can hopefully help creators make games as Treastory by themselves.

Ultimately, the research offers new possibilities of learning history through cultural relics. The results from the testings have reference value for the study of history learning improvement. In the future, the continuation of the project may have more findings and attempts, hoping to provide a preferable game experience of history learning with addition of content and improvement.

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Appendices

A. Material of First User Test

“Chistory”基于交互式游戏的历史学习--以文物为线索的实验

日本庆应私塾大学大学院 Media Design 研究科 金阳

当今社会越来越重视历史和传统文化的教育，如何提高学生对历史和传统文化的学习兴趣，是本课题研究的方向。

本课题研究的方法，是通过以历史文物为线索的交互式游戏，在游戏的过程中激发学生对历史文化的兴趣，促使他们自发地去更深入地了解更多的历史文化知识。

实验目的

本次实验将通过观察单向性阅读与交互性游戏两组不同的学习方式，观察和比较两组学习效果。

实验内容：

对象：高一学生52名，男女各26名

日期：2019年9月26日

实验方法：对比实验

学生通过抽签分成A与B两组。两组将分别在不同房间进行不同的实验。

A组：男女各13名，阅读纸质资料。

B组：男女各13名，游玩平板游戏。

实验步骤：

- | | |
|---------------------------------|---------------|
| 1. 说明实验流程 | 需时 5 分钟 |
| 2. 男女学生分别抽签，分组移动教室后，分发小礼品 | 需时 5 分钟 |
| 3. 学生回答调查问卷1，在此期间，教室的负责人分发实验用资料 | 需时 5 分钟 |
| 4. 说明注意事项，进行分组实验 | 需时 25分钟 |
| 5. 实验结束后再次回答问卷， | 需时 10分钟 |
| 合计 | 需时50分钟 |

Figure A.1: Plan of First User Test Page 1

需要学校和学生配合的准备工作：

1. 学校准备两间教室分别进行两组实验
2. 请学生各自携带一只笔（铅笔，圆珠笔，水笔皆可）
3. 请游戏组的学生在拿到平板后，不要随意点击游戏内容以外的程序，耐心等待实验开始。
4. 请学生抽签结束后不要扔掉写有抽签编号的纸条，抽签编号将用于问卷调查。请负责的老师在回收问卷时检查问卷右上角是否写有编号。
5. 分发调查问卷2之前，回收所有实验用的资料，以确保学生不会回看实验内容。

Figure A.2: Plan of First User Test Page 2

阅读材料

北宋的建立

公元 10 世纪 60 年代建立的北宋，结束了五代十国时期的分裂局面，实现了局部统一。与北宋并存的少数民族政权，有东北的辽、西北的西夏、西南的吐蕃和大理。辽、宋、西夏之间发生过多次战争，但也保持了相当长时间的和平局面。



960 年，后周将领赵匡胤发动兵变，建立了宋朝，定都开封，史称北宋。北宋王朝逐步统一了从岭南至黄河流域的广大地区。为防止盘镇割据局面的重演，宋初统治者采取了一系列措施加强中央集权，解除了一批高级将领的兵权，派京朝官出知各州县，将地方军权、财权和管使任免权收归中央，采用分割事权的方式削弱相权，同时扩大科举入仕之门，保证文官队伍的延续。

陈桥事变

距河南开封东北约 20 千米处，穿过黄河古道，一片黄沙弥漫之中，能见到一座歇檐式屋顶的建筑。拾阶而入，是一座不大的院落，院中铁栅栏围起一株形态怪异的古槐树，黑褐色的枝干仿佛曾经被烈火熏烧过，弯曲的树干似乎背负着沉重的历史包袱。这座院落就是古代驿站——陈桥驿的遗址。一千多年前，在这里发生了影响中国历史进程的一大事——陈桥兵变。那棵枯干的古槐，据说是兵变谋划者赵匡胤用来系战马的，因而被叫做系马槐。槐树旁边矗立的石碑上书写着“宋太祖黄袍加身处”几个大字。

一千多年前，在这座普通的院落里究竟发生了什么？

Figure A.3: Group A Reading Material in First User Test Page 1

阅读材料

据宋代史料描述，后周显德七年（960）正月初三，一支军队在禁军统帅、殿前都点检——赵匡胤的率领下，浩浩荡荡地穿过京城长景门，向北进发，准备抵御北汉和契丹的进犯。黄昏时分，大军来到陈桥驿安营扎寨。将近黎明，四面叫喊声骤起，声震原野。醉卧之中的赵匡胤正要起身，他的弟弟赵匡义和谋事赵普匆匆进门禀报，诸将领要求“立点检为太子，然后



北征”。正说，传来急促的叩门声，赵匡胤推门而出，诸将领已手执兵器环立院中，“诸将无主，愿策点检为天子”的声音此起彼伏，有将领拿出一件黄袍披在赵匡胤的身上，其他将领马上拜倒在地上，齐呼“万岁”。赵匡胤再三推辞，众将领不答应，将他强行簇拥上马，向京城方向返回。

赵匡胤万般无奈，说道“你们贪图富贵，立我为天子，若能听从我的命令，我就同意；如若不然，我就不能当你们的主子。”

众将听了这番话，全都下马表白：“唯命是从。”

赵匡胤又说道：“近世帝王初立时，进入京城都纵兵大掠，擅劫府库，你们不得如此，待大事已定，当有厚赏；否则诛杀全族。”

众将皆拜。于是，大家重新上马，整军回师京城，北上抵御外敌进犯的任务似乎已不存在。

赵匡胤的把兄弟、殿前都指挥使石守信作为内应，早已打开宫门迎候。当日，百官早朝未退，诸将已簇拥着赵匡胤进入皇城明德门。

见到后周宰相范质、王溥，赵匡胤流着泪水说道：“我受先帝厚恩，一旦至此，惭愧天地，但被六军所迫，也不知该怎样做才好。”

范质等尚未答话，站在赵匡胤身后的一名大将挺剑向前，喝到“我辈无主，今日必得天子！”无论赵匡胤怎么呵斥，诸将不退，见此情形，两位后周宰相只好跪拜于地，向这位昔日同僚山呼万岁。

Figure A.4: Group A Reading Material in First User Test Page 2

阅读材料

接下来的事情就更好办了，全有前朝先例。赵匡胤在宰相的引导下来到崇元殿行禅位礼。召文武百官就列，宰相扶新皇帝升殿，穿上龙袍，群臣拜贺。朝廷原主人——后周恭帝也被请了出来，封为郑王，遣送西宫居住。

陈桥兵变的发生，在当时并不是什么稀罕事。约十年前，同样的一幕就曾上演过。

950年11月，后汉禁军大将郭威受命抵御辽军进犯，率兵到澶州，将士们也称天下无主，撕下一面黄旗披到郭威身上。郭威被众将士的赤诚所打动，“被迫”当上了皇帝，接着便不记得还有北上御敌的任务。直赴京城，逼后汉幼主及寡太后“禅让”，完成了由后汉至后周的演变。

赵匡胤不仅亲眼目睹了那一次黄袍加身，而且作为郭威的亲信，他也是那次兵变的参与者之一。稍稍不同的是，郭威以“周”代“汉”，以示崇高三代之美德；大约考虑到周王朝以前的朝代均以荒暴天子而终，赵匡胤果断地摒弃了这种一味好古的习气，因其并之前他领宋州归德军节度使，便命名新的王朝为“宋”。除此之外，几乎每一细节都在效仿他的前朝主子。尤其相似的是，郭威在正月初五（951年2月13日）改国号为周，改元为广顺，成为后周的第一代天子，去世后庙号太祖。赵匡胤也是在正月初五（960年2月4日）改国号为宋，改元为建隆，成为宋朝的第一代天子，驾崩后庙号太祖。



Figure A.5: Group A Reading Material in First User Test Page 3

抽签编号: _____

A 组调查问卷 1(实验前)

本次问卷调查采用匿名回答的形式, 问卷数据仅用于学术研究, 不会用于任何商业用途及学业评定中。感谢大家配合协助完成本次调研!

1. 性别: 男 / 女
2. 最主要的兴趣爱好: A 文学 B 历史 C 艺术 D 游戏 E 科技 F 其他: _____
3. 我的学业成绩: A 班级上游 B 班级中上游 C 班级中游 D 班级中下游 E 班级下游
4. 您平时阅读课外书的频度是?
A 从不阅读 B 平均每天 0.5 小时以内 C 平均每天 0.5-1 小时 D 平均每天 1-1.5 小时
E 平均每天 1.5-2 小时 F 平均每天 2 小时以上
5. 您平时喜欢阅读什么类型的读物? (若不熟悉类型可直接写下名字)
A 小说 B 人物传记 C 纪实文学 D 历史类 E 漫画 F 旅游 G 科普 H 其他: _____
6. 除了校内的历史教材以外, 您还看过哪些历史题材相关的书籍/影视/动漫/游戏?

7. 您是否有参与过任何问卷调查的经验? A 有 B 无

8. 请根据您的目前的状态, 从 0 到 10 对自己进行评分

	完全不符合		一般						完全符合		
(1) 我喜欢历史	0	1	2	3	4	5	6	7	8	9	10
(2) 我感觉历史学习令人沮丧	0	1	2	3	4	5	6	7	8	9	10
(3) 我对宋朝的历史很感兴趣	0	1	2	3	4	5	6	7	8	9	10
(4) 我了解宋朝的历史	0	1	2	3	4	5	6	7	8	9	10
(5) 我觉得历史人物很有趣	0	1	2	3	4	5	6	7	8	9	10
(6) 我觉得历史故事很有趣	0	1	2	3	4	5	6	7	8	9	10
(7) 我在历史学习中集中注意力	0	1	2	3	4	5	6	7	8	9	10
(8) 我现在感到很放松	0	1	2	3	4	5	6	7	8	9	10

Figure A.6: Group A Pre-questionnaire in First User Test

抽签编号: _____

A 组调查问卷 2 (实验后)

1. 请根据您的实验后的状态, 从 0 到 10 对自己进行评分

	完全不符合	一般	完全符合								
(1) 我喜欢历史	0	1	2	3	4	5	6	7	8	9	10
(2) 阅读后我依然感觉历史学习令人沮丧	0	1	2	3	4	5	6	7	8	9	10
(3) 我对宋朝的历史很感兴趣	0	1	2	3	4	5	6	7	8	9	10
(4) 我了解宋朝的历史	0	1	2	3	4	5	6	7	8	9	10
(5) 我觉得历史人物很有趣	0	1	2	3	4	5	6	7	8	9	10
(6) 我觉得历史故事很有趣	0	1	2	3	4	5	6	7	8	9	10
(7) 我很享受阅读的过程	0	1	2	3	4	5	6	7	8	9	10
(8) 我在阅读中集中注意力	0	1	2	3	4	5	6	7	8	9	10
(9) 我在阅读后感到很放松	0	1	2	3	4	5	6	7	8	9	10
(10) 我了解更多的相关历史文化	0	1	2	3	4	5	6	7	8	9	10

2. 在这次阅读中, 您有没有产生中断阅读的想法? 如果有, 请写下您的理由。

A 有。理由: _____ B 没有

3. 您是否有参与过与本次内容或形式类似的活动?

A 有 B 没有

4. 在这次阅读中, 对您而言最吸引您的部分是什么?

5. 请尽可能列举在这次阅读中出现过的历史名词 (数量不限):

人物: _____

地点: _____

Figure A.7: Group A Post-questionnaire in First User Test page 1

抽签编号: _____

事件:

6. 您觉得什么样的阅读材料能够激起您对历史的兴趣?

7. 您觉得如何学习历史对您而言是最合适的?

Figure A.8: Group A Post-questionnaire in First User Test page 2

抽签编号: _____

B 组调查问卷 1 (实验前)

本次问卷调查采用匿名回答的形式, 问卷数据仅用于学术研究, 不会用于任何商业用途及学业评定中。感谢大家配合协助完成本次调研!

1. 性别: 男 / 女
2. 最主要的兴趣爱好: A 文学 B 历史 C 艺术 D 游戏 E 科技 F 其他: _____
3. 我的学业成绩: A 班级上游 B 班级中上游 C 班级中游 D 班级中下游 E 班级下游
4. 您平时玩游戏的频度是?

A 从不玩 B 平均每天 0.5 小时以内 C 平均每天 0.5-1 小时 D 平均每天 1-1.5 小时
E 平均每天 1.5-2 小时 F 平均每天 2 小时以上
5. 您平时喜欢玩什么类型的游戏? (若不熟悉类型可直接写下游戏名字)

A 文字探险 B 解谜 C 电竞 D 益智 E 音乐 F 历史模拟 G 经营 H 其他: _____
6. 除了校内的历史教材以外, 您还看过哪些历史题材相关的书籍/影视/动漫/游戏?

7. 您是否有参与过任何问卷调查的经验? A 有 B 无

8. 请根据您的目前的状态, 从 0 到 10 对自己进行评分

	完全不符合	一般	完全符合
(1) 我喜欢历史	0 1 2 3 4 5 6 7 8 9 10		
(2) 我感觉历史学习令人沮丧	0 1 2 3 4 5 6 7 8 9 10		
(3) 我对宋朝的历史很感兴趣	0 1 2 3 4 5 6 7 8 9 10		
(4) 我了解宋朝的历史	0 1 2 3 4 5 6 7 8 9 10		
(5) 我觉得历史人物很有趣	0 1 2 3 4 5 6 7 8 9 10		
(6) 我觉得历史故事很有趣	0 1 2 3 4 5 6 7 8 9 10		
(7) 我在历史学习中集中注意力	0 1 2 3 4 5 6 7 8 9 10		
(8) 我现在感到很放松	0 1 2 3 4 5 6 7 8 9 10		

Figure A.9: Group B Pre-questionnaire in First User Test

抽签编号: _____

B 组调查问卷 2 (实验后)

1. 请根据您的实验后的状态, 从 0 到 10 对自己进行评分

	完全不符合	一般	完全符合
(1) 我喜欢历史	0	1 2 3 4 5 6 7 8 9	10
(2) 游戏后我依然感觉历史学习令人沮丧	0	1 2 3 4 5 6 7 8 9	10
(3) 我对宋朝的历史很感兴趣	0	1 2 3 4 5 6 7 8 9	10
(4) 我了解宋朝的历史	0	1 2 3 4 5 6 7 8 9	10
(5) 我觉得历史人物很有趣	0	1 2 3 4 5 6 7 8 9	10
(6) 我觉得历史故事很有趣	0	1 2 3 4 5 6 7 8 9	10
(7) 我很享受游戏的过程	0	1 2 3 4 5 6 7 8 9	10
(8) 我在游戏中集中注意力	0	1 2 3 4 5 6 7 8 9	10
(9) 我在游戏后感到很放松	0	1 2 3 4 5 6 7 8 9	10
(10) 我了解更多的相关历史文化	0	1 2 3 4 5 6 7 8 9	10

2. 在这次游戏中, 您有没有产生中断游戏的想法? 如果有, 请写下您的理由。

A 有。理由: _____ B 没有

3. 您是否有参与过与本次内容或形式类似的活动?

A 有 B 没有

4. 在这次游戏中, 对您而言最吸引您的部分是什么?

5. 请尽可能列举在这次游戏中出现过的历史名词 (数量不限):

人物: _____

地点: _____

Figure A.10: Group A Post-questionnaire in First User Test page 1

抽签编号: _____

事件:

6. 您觉得什么样的游戏能够激起您对历史的兴趣?

7. 您觉得如何学习历史对您而言是最合适的?

Figure A.11: Group A Post-questionnaire in First User Test page 2

B. Programming

```

1  using System.Collections;
2  using System.Collections.Generic;
3  using UnityEngine;
4
5  public class PlayerControl : MonoBehaviour
6  {
7
8      public float speed = 3; //パラメータ
9      public float direction_x = 1.0f;
10     private Rigidbody2D rb2d;
11     private Animator anim; //アニメーションつける
12     private SpriteRenderer spRenderer;
13     public bool isControl;
14     public bool isPCcontrol;
15     public bool isInEvent;
16
17     // Start is called before the first frame update
18     void Start()
19     {
20         this.rb2d = GetComponent<Rigidbody2D>();
21         this.anim = GetComponent<Animator>();
22         this.spRenderer = GetComponent<SpriteRenderer>();
23     }
24
25     void Update()
26     {
27         if (isPCcontrol == false)
28         {
29             //Touch touch = Input.GetTouch(1);
30             if (Input.touchCount > 0 && isInEvent == false && isControl == false)
31             {
32
33                 Vector2 touch = Input.GetTouch(0).position;
34
35                 //画面右半分をタッチしていたら右に移動
36                 if (touch.x > Screen.width * 0.5f)
37                 {
38                     direction_x = 1;
39                 }
40                 else if (touch.x < Screen.width * 0.5f)//画面左半分をタッチしていたら左に移動
41                 {
42                     direction_x = -1;
43                 }
44                 else
45                 {
46                     direction_x = 0f; //何もタッチしていない場合は反応なし|
47                 }
48             }
49             else
50             {
51                 direction_x = 0f; //何もタッチしていない場合は反応なし
52             }
53         }
54
55         // スプライトの向きを変える
56         if (direction_x < 0)
57         {
58             spRenderer.flipX = true;
59         }
60         else if (direction_x > 0)
61         {
62             spRenderer.flipX = false;
63         }
64
65         float velX = rb2d.velocity.x;
66
67         if (Mathf.Abs(velX) > 2)
68         {
69             if (velX > 2.0f)
70             {
71                 rb2d.velocity = new Vector2(2.0f, rb2d.velocity.y);
72             }
73             if (velX < -2.0f)
74             {
75                 rb2d.velocity = new Vector2(-2.0f, rb2d.velocity.y);
76             }
77         }
78     }
79
80

```

Figure B.1: PlayerControl.cs Programming line 1-80

```

85     }
86
87     else
88     {
89         if(isInEvent == false && isControl == false)
90         {
91             float pc_x = Input.GetAxisRaw("Horizontal");
92
93             if (pc_x < 0)
94             {
95                 spRenderer.flipX = true;
96             }
97             else if (pc_x > 0)
98             {
99                 spRenderer.flipX = false;
100            }
101
102            rb2d.AddForce(Vector2.right * pc_x * speed);
103
104            float pc_velX = rb2d.velocity.x;
105
106            if (Mathf.Abs(pc_velX) > 2)
107            {
108                if (pc_velX > 2.0f)
109                {
110                    rb2d.velocity = new Vector2(2.0f, rb2d.velocity.y);
111                }
112                if (pc_velX < -2.0f)
113                {
114                    rb2d.velocity = new Vector2(-2.0f, rb2d.velocity.y);
115                }
116            }
117        }
118    }
119
120    anim.SetFloat("Speed", Mathf.Abs(rb2d.velocity.x)); // 歩くアニメーション
121
122
123
124
125    private void FixedUpdate()
126    {
127        if (isPCcontrol == false)
128        {
129            rb2d.velocity = new Vector2(speed * direction_x, rb2d.velocity.y);
130        }
131    }
132
133
134
135    public void SetEvent()
136    {
137        isControl = true;
138    }
139
140    public void SetnotEvent()
141    {
142        isControl = false;
143    }
144
145
146
147    public void SetPlayerPos(int phase_num)
148    {
149        //Vector2 playerpos = this.transform.localPosition;
150        switch (phase_num)
151        {
152            case 1:
153                gameObject.transform.position = new Vector2(5.0f, 1.1f);
154                break;
155            case 2:
156                //playerpos.x = 51.6f;
157                gameObject.transform.position = new Vector2(30.0f, 1.1f);
158                break;
159            case 3:
160                gameObject.transform.position = new Vector2(55.0f, 1.1f);
161                break;
162            case 4:
163                gameObject.transform.position = new Vector2(70.0f, 1.1f);
164                break;
165        }
166    }
167
168    public void SetPlayerPCcontrol()
169    {
170        isPCcontrol = false;
171    }

```

Figure B.2: PlayerControl.cs Programming line 81-170