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An exploration on using a storytelling game in history education

Master's thesis in Applied Computer Science
Supervisor: Rune Hjelsvold
December 2021

Master's thesis

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Kunnskap for en bedre verden

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Abstract

This thesis explores the potential of using a story-telling serious game in history education as an attempt to solve some of the history education challenges that were discovered from interviews conducted in preparation for the thesis. A literature review was done to establish the connection between the different areas involved in the thesis including story-telling, serious games, and history education. The literature review highlighted some positive links between the benefits of story-telling in education and the methods that can be used to improve students' ability to contextualize, connect and comprehend historical knowledge. By combining storytelling and video games, the learners can obtain the knowledge firsthand under different identities, time, and space. A story-telling game prototype based on a historical period was designed, developed, and evaluated by the domain experts - history teachers and students.

The evaluation was conducted in the form of semi-structured interviews to enable the experts to give as much feedback as they can. The domain experts gave multiple positive as well as constructive feedback on the features available in the game as well as its structure. In addition to the game graphic and interaction mechanisms, it was discovered from the interviews that the way information is organized in the game has a major impact on the player's motivation and experiences. On the application side, the experts liked the practical approach of the game where the player can actively learn the lesson as they go through the game and thought it is a unique approach that can deliver a new exciting way of learning to students. When being asked about how they can see the game fits into a history class, they answered that the game prototype can be used as a material in a history class at either the beginning of the class to introduce the history lesson to the students or at the end of the class to help the students reviewed the historical knowledge that they have learned. After two rounds of evaluation, the domain experts deemed the game prototype is ready to be tested in a classroom context.

Sammendrag

Denne oppgaven utforsker potensialet ved å bruke et historiefortellende seriøst spill i historieundervisningen som et forsøk på å løse noen av historieutdanningsutfordringene som ble oppdaget fra intervjuer utført som forberedelse til oppgaven. En litteraturgjennomgang ble gjort for å etablere sammenhengen mellom de ulike områdene involvert i oppgaven, inkludert historiefortelling, seriøse spill og historieundervisning. Litteraturgjennomgangen fremhevet noen positive sammenhenger mellom fordelene med historiefortelling i utdanning og metodene som kan brukes for å forbedre elevenes evne til å kontekstualisere, koble sammen og forstå historisk kunnskap. Ved å kombinere historiefortelling og videospill kan elevene få kunnskapen på egen hånd under ulike identiteter, tid og rom. En prototype basert på en historisk periode ble designet, utviklet og evaluert av domeneekspertene – historielærere og studenter.

Evalueringen ble gjennomført i form av semistrukturerte intervjuer for å gjøre det mulig for ekspertene å gi så mange tilbakemeldinger de kan. Domeneekspertene ga flere positive så vel som konstruktive tilbakemeldinger på funksjonene som er tilgjengelige i spillet, så vel som dets struktur. I tillegg til spillgrafikken og interaksjonsmekanismene, ble det oppdaget fra intervjuene at måten informasjon er organisert i spillet på har stor innvirkning på spillerens motivasjon og opplevelser. På applikasjonssiden likte ekspertene den praktiske tilnærmingen til spillet der spilleren aktivt kan lære leksjonen mens de går gjennom spillet, og mente det er en unik tilnærming som kan gi elevene en ny spennende måte å lære på. På spørsmål om hvordan de kan se at spillet passer inn i en historietime, svarte de at spillprototypen kan brukes som materiale i en historietime enten i begynnelsen av timen for å introdusere historietimen for elevene eller på slutten av klassen for å hjelpe elevene med å gjennomgå den historiske kunnskapen de har lært. Etter to runder med evaluering anså domeneekspertene at spillprototypen var klar til å bli testet i klasseromssammenheng.

Acknowledgement

I would like to express my gratitude to my supervisor, Rune Hjelsvold, who guided me throughout this project. He was extremely patient as well as flexible to adapt with my way of working. I would also like to thank my best friend, Mai Nguyen, who offered great help with her game development skills in the design phase of the game prototype. As well as the domain experts who put out the time to evaluate the game prototype despite their busy schedule. Finally, I wish to extend my special thanks to my colleagues at Airthings, my friends and family who encouraged me and offered help proofreading the thesis multiple times. This thesis would not have been possible with out all of you.

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Chapter 1

Introduction and Methodology

1.1 Introduction

1.1.1 Statement of the problem

Historical consciousness has been at the center of attention of history researchers and educators. In short, historical consciousness is defined as the understanding of the temporality of historical experience or how past, present, and future are thought to be connected [1]. To be more specific, by having a historical consciousness, one would be able to "[incorporates] the connection between the interpretation of the past, the understanding of the present, and perspectives on the future" [2].

The work in thesis is based on advanced project work and the research questions for those courses were to define the problems and see if a game can solve any of the challenges that history education is facing. To summarize, from seeing historical consciousness as a central component in history education, I started performing literature reviews as well as conducting interviews with high school teachers to see if they were able to activate their students' consciousness in the subject. Interviews were conducted with a social sciences teacher in Norway and two history teachers in Vietnam. This was all done in my previous work to prepare for this thesis. The result of the literature reviews exposed the shifting in the teaching method of history education. From its "traditional" way of teaching, which focuses on memorization of historical facts and presenting history in a mono-perspectival way, history education now focuses on understanding and looking at history with many different perspectives. This shift causes a "*cultural lag*" among history teachers as they have conflicting roles between being a professional and a person who has their own *personal* view and experience of history [3].

The results from the interviews revealed different methods that are currently used in teaching history in Vietnam and social sciences in Norway. Despite being two distinct subjects in two different countries, they shared some similarities in challenges and teaching methods. The teachers in both subjects want to focus

on developing the students' ability in thinking critically and perform contextual analysis to obtain a multi-perspective view on a certain issue within the subject's domain.

One concern that has long been a problem is the lack of motivation and engagement during class. In Vietnam, this is caused partly by history not being considered a main subject. Another challenge is that students cannot related to the history lessons as many students find it is too dry and mono-perspectival coming from textbooks and lectures. The teachers then try to improve their teaching by instead of using textbooks, they retell history in the form of a story and combine it with historical media such as images, short movies, songs, etc. This method of teaching greatly improves the students' engagement in class. However, the mentioned historical media and this teaching method were not able to help the students improve the ability to think and assess historical events critically, to be able to perform contextual analysis and make comparisons and interpretations to come to understand why things happened the way they did. This method proved to be insufficient in activating and developing students' historical consciousness as it does not help the students form a link between different timeline and different perspectives in history despite having a positive impact on students' engagement in the classroom.

The teachers then go further and experiment with organizing mini-games to let groups discuss and come up with answers to a set of questions with the rewards of bonus points. This method is similar to the one that is being applied by the social sciences teacher in Norway, except that the social sciences teacher use digital games instead of gamifying group discussions. In both cases, the teachers notice that the students become more motivated and engaged in the problem as playing the game give them the chance to solve the problems and being responsible for the choices themselves. They both report that there is a great enhancement in group discussion quality and students' understanding towards the problem when gamification and/or a game is used in their teaching.

Results from the interviews also show that teachers prefer using games on the web for their teaching as they do not possess much knowledge on technology and these games can run on the go without a complicated process to install and setup gaming software. An additional problem with history teachers in Vietnam is that, despite wanting to use digital game in their teaching, such a game does not exist in Vietnam. With the lack of knowledge in technology and foreign language, it is difficult to find a game that portraits a specific topic that they want to convey.

1.1.2 Research aims

Seeing the problems, I want to use this thesis to produce a prototype of a game that can be used in teaching to help students experience history and gain a deeper knowledge of different perspectives in the past. Additionally, I noticed from the interviews with the teachers that they always try to convey the knowledge of the lesson to the students in the form of a story, no matter the materials they used as

a supplementary material for their lesson. Therefore, I decided to also explore the benefits of story-telling in learning, as well as the link between the areas between story-telling, learning and video games in this thesis as a base to move forward and develop the game prototype.

The result of the thesis can serve as research material to schools which are looking to try new means to improve the teaching quality, which in turn will be beneficial to history teachers as well as students. It will also serve as a resource and reference for game/serious games developers and designers in Vietnam and other countries should they want to develop historical serious games.

Additionally, as mentioned in the interview result, teachers revealed that they prefer using games on the web considering their lack of knowledge regarding technology, therefore, in this thesis, the game prototype will be developed and deployed to a public domain where the teachers can access and give some evaluation on the game design and mechanics, as well as feedback for improvements so that it can be used as a teaching support tool besides other historical media such as textbooks, magazines, or movies.

1.1.3 Thesis outline

This thesis contains 7 chapters. First and present, chapter 1 will give a brief introduction to the groundwork that helps define the problem area, which in turn helps defining the focus of the thesis. The research aim will then be presented to give an overview of the final product, and how the product will be assessed along with the research questions of the thesis. This chapter is also used to present the research goals and the methodologies that were used to answer them.

Chapter 2 will provide the reader with background knowledge to the domains that are relevant to the work of this thesis in the form of literature review and summaries of related works. First, the concepts used and the general focus of learning outcomes in history education are explored and made clear. Then, game-based learning is studied to see how games can help motivate and engage student in learning history compared to other media such as textbooks, movies, etc. After that, the topic of storytelling, its effect in learning and the topic of storytelling games is investigated to see if they have proper alignments with the focus of history education. Next, related works which look into the use of digital games as support tools in historical education are reviewed and summarized to give the reader an overview of how digital games are useful as historical learning contexts.

Afterwards, the game topic and learning outcomes will be presented in chapter 3 along with the process of how the game design concept and mechanics were developed. Chapter 4 will give information about the technology used and the development process of the game including the game architecture, key functionalities, implementation process and the challenges I encounter while developing the game. The research questions stated in this chapter will be answered in chapter 5 along with screenshots of the game prototype. This chapter will be divided

into research results and development results. Finally, reflection and discussion of the whole process will be provided in chapter 6. The thesis will be concluded in chapter 7 with a summarize of the work done in the thesis as well as recommendation for work that can be done in the future to actually deliver the product to the classroom.

1.2 Research Goals

The first goal of this thesis is to explore the common grounds between story-telling and serious game and the benefits of story-telling games in learning to validate the development of the game prototype, which belongs to the story-telling game genre. For this research goal, the work will concentrate on the following questions:

1. What are the benefits of story-telling in learning?
2. What kind of benefits does story-telling games have compared to other story-telling media?
3. Under which form can story-telling games appear? And which form of story-telling game is the most effective for learners?

The second goal of the thesis is to develop and evaluate a story-telling serious game based on a historical topic. The design and development of the game will focus on answering the research questions below:

1. How can the game incorporate historical knowledge into its content while maintaining engagement with the player?
2. What features are useful in maintaining engagement and conveying the necessary knowledge to the player? Under which context can the game be part of the teaching curriculum?
3. In what ways can it be improved to be suitable in the teaching context?

1.3 Methodology

1.3.1 Literature study

As this thesis is related to multiple disciplinaries besides computer science, literature study is conducted to explore the link between various topics and related works in games for history education. This method is also used to acquire knowledge of how digital games were designed and used in history education and their effect on the ability to learn history.

1.3.2 Consultation

History researchers, narrative designers and game developers were regularly consulted throughout the concept and mechanic design phase to ensure the game elements and learning outcomes are aligned and balance in the prototype.

A teacher with 25 years experience in teaching high school history, and a student in his final year in history education at Ho Chi Minh City Pedagogical University were consulted for their expectation of knowledge that the student would learn after playing through the prototype. A high school student was also involved in the evaluation process of the game prototype.

Additionally, I asked for help from the narrative designer community for storyline and dialogue design principles. They introduced me to books and resources which gives me the insight to some basic ideas in how to use game elements such as tomes, dialogues, etc. to help convey the narrative in a way that attracts the player.

Finally, I consulted some of the game developers that I know to help put together all of the pieces together and produce a game design document which incorporates the functionalities and game elements to the game concept to form a clearer picture of the game which is extremely helpful in the development phase.

1.3.3 Interviews

Semi-structured interviews were conducted to get both insights of history education challenges and feedback of the game prototype in this thesis. In the first phase, where the intention were to get an insight of the problems in history education in Vietnam, as the history teachers in Vietnam are harder to reach due to the time differences and their unfamiliarity with the English language, the topic was explained and the questionnaire was translated to Vietnamese and send to them beforehand for preparation.

In the feedback phase, as there is a game prototype involves, questionnaire is prepared to be visible only to the author. Interviews were then structured a little differently. The interview of around 1 hour duration was first scheduled with the interviewee. At the beginning of the interview, the topic is explained, and the game prototype was presented with the author's introduction to the gameplay and its objective. The author will then walkthrough the prototype with the interviewee and introduce different functionalities and ask the interviewee for feedback of how they think the functionality can come in useful in the context of conveying history, and the discussion evolves from there. The interviewee's opinions are recorded in paper form. The interviewee opinion on the game as a whole and extra functionalities suggestion were also consulted during these interviews.

1.3.4 Auto-ethnography

Autoethnography is a research method that uses personal experience ("auto") to describe and interpret ("graphy") cultural texts, experiences, beliefs, and practices ("ethno"). This method is applied when the author possess personal experience and/or knowledge that can be used to (1) complement and fill gaps in existing research; or (2) articulate insider knowledge of cultural experience. [4]

As a used-to-be high school student in Vietnam, I have the relevant insights to this project regarding the struggle in learning history due to the lack of context, media and time that leads to loss of interest and motivation. Furthermore, as a

Vietnamese, my knowledge of Vietnam's history and cultural context (eg. traditions, beliefs, etc.) becomes especially useful when it comes to interpret, analyze and synthesize the data in the historical documents used in this project as the documents are dated and mostly available in French and Vietnamese.

1.3.5 Prototyping

As everything in the game is developed from scratch, from concept to functionalities, prototyping is applied as it is a flexible model that can help in refining and clarifying the requirements on the go as it involves the end user into the development cycle, in this case, the history teacher and student. It will also allow the end-user to have a better understanding of the system and its purposes.

Using this method, the prototype is developed, then is given to the student and teachers for feedback. The design and/or the product is then refined and improved based on the end-user's feedback and go through evaluation again until it is good enough to be released as the end product. Figure 1.1 represents the steps of the prototyping model. This thesis, however, does not intend to reach the end-product step due to significant workload and time restraints.

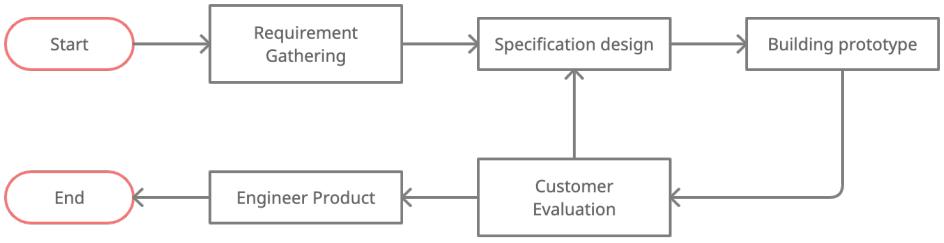

Figure 1.1: Prototyping model

Chapter 2

Literature Studies

2.1 Background

This chapter presents some background knowledge in historical consciousness and serious games. It also establishes a link between storytelling, learning and games along with an example related work of using story-telling game in education. Furthermore, as part of exploring the maturity of develop games for education on the web, there is a section dedicated to exploring some technologies that can be used to implement a web game.

2.1.1 Historical consciousness in history education

For the sake of explaining one of the approach to develop historical consciousness in an individual, the concept of historical knowledge and historical thinking should be made clear. These concepts definitions and interpretations as well as the claims about the challenges that history teachers are facing in this section are mostly based on the work of Robert Thorp in his theses *Historical Consciousness, Historical Media, and History Education* in 2014 and *Uses of history in history education* in 2016, and some others. The summaries of these works are available in my report in another course [5].

Historical knowledge

There are four aspects of historical knowledge, according to Thorp:

1. "Basic historical facts (i.e. facts that are tentatively accepted by a scientific (or other) community): that World War I was fought between the years 1914 and 1918, for instance."
2. "1st and 2nd order concepts. 1st order concepts are used to order and categorise various historical facts in different cohorts of knowledge (ie. "feudalism", "the French Revolution", etc.). 2nd order concepts are used to analyse history synchronously and diachronously (ie. causation, continuity and change, significance, etc.). 2nd order concepts are the key to be able to think historically, these concepts will be further elaborate below."

3. "Contextualization (contextual analysis) is the ability to appreciate the importance of how one's temporal and spatial context influence their epistemic attitudes towards knowledge, therefore, their understanding of the world and history. This can be achieved by applying historical thinking to history. Contextualization makes it possible for an individual to navigate between differing accounts of history and also provide a method for ascertaining the value of the historical piece of information we have at hand."
4. "Inter-subjectivity is the ability to grasp the context of how history is interpreted and represented. To be able to make inter-subjectively acceptable truth-claims concerning history, it is essential that historical knowledge is contextualised according to how we have come to be certain of the historical knowledge we possess."

Historical Thinking

Historical thinking is defined as the ability to appreciate how historical knowledge is constructed and to know what that means. Historical thinking enables an individual to make contextual analyses of history by applying 1st and 2nd order concepts to history. From realizing that the value of historical knowledge is dependent on the interpretation and representation of the historian, or writer of history, one thereby gain a meta-historical understanding that allows them to assess and use historical accounts, frameworks, and facts. [2]

There are six key concepts in historical thinking, presented by Seixas [6] in The historical thinking project and was mentioned in Thorp's work. These concepts are also considered as challenges that historians are facing, and students, to be able to work with history, should learn to master the cognitive skills with which historians perform their trade [7]. To be able to think historically, students need to be able to [6]:

1. Establish *historical significance*: Establish historical significance by articulating the narratives that may be legitimately constructed around a particular event, resonating in a larger community. This relates to why certain historical events or figures are meaningful while others are not. How do historians (or anyone at all) select from historical events, figures, etc., to learn, speak, and write about? What moves a piece of information from being personal interest to be historically significant? The irresolvable tension of historical significance' emerges out of this line of thinking.
2. Use *primary source evidence*: By paying attention to the primary source, the context of the source, and the questions with which the source is approached when they are using it as history is an interpretation based on inferences from these sources.
3. Identify *continuity and change*: when analyzing the ruptures and continuities between the present and the past, one examines the (obvious) cataclysmic change and searches for the hidden continuities.
4. Analyze *cause and consequence*: Historical change is driven by multiple causes that can vary in their influence. Students need to be able to make a contex-

tual analysis of the interplay between historical actors and social, political, economic, and cultural conditions on events' changes.

5. Take *historical perspectives*: "In order to grasp the past, we need to understand the historical context of historical actors and take their perspective and try to infer what they might have felt and thought, but we also must acknowledge the limitations of doing so." To avoid presentism, the understanding of the differences between the past and the present is necessary.
6. Understand the *ethical dimension* of historical interpretation: "by having an ethical awareness regarding these three inter-related problems: (i) 'the problem of judging actors and actions from the past,' (ii) 'dealing with the past crimes and injustices whose legacies [. . .] we live with today,' and (iii) 'the memorial obligations that we in the present owe to victims, heroes, or other forebears who made sacrifices from which we benefit'."

Historical consciousness

According to the affirmative strand, which is the dominant one compared to the sceptical strand in research that uses the concept, historical consciousness is a concept that "[incorporates] the connection between the interpretation of the past, the understanding of the present, and perspectives on the future.". Thorp listed three ideas from which one can gain the chance to activate and/or develop historical consciousness, they are as following:

1. **Exposing one to history multi-chronologically or multi-perspectively**: This idea is furthermore claimed that a personal, private encounter with history, which is closely connected with the idea of being confronted with moral values in history, has a good chance of developing a historical consciousness in an individual.
2. **Have one to take a genetic and genealogical approaches to history**: This approach means that one should regard history as beginning at a certain moment in time and stopping at another (genetically). And, between these temporal positions, one should try to understand why are these aspects or eras of history interesting and significant to us and why do we choose to interpret history the way we do (genealogically). This idea more or less forces an individual to view history multi-chronologically, thus developing their historical consciousness.
3. **Have one to apply historical thinking to their historical consciousness** by using 1^{st} and 2^{nd} order concepts of history as tools to analyze history and historical accounts.

2.1.2 Games and Serious Games

Video games have become one of the most important segments of the entertainment industry [8]. With engaging storylines, various non-player characters (NPCs) with different races, backgrounds, the ability to travel to places with little to no cost, etc., the game world provides its players with endless possibilities. Gamers feel that they can achieve more in the game world than in real life, they become

the best version of themselves in the game – the most likely to help at a moment's notice, the most likely to stick with a problem as long at it takes, to get up after failure and try again [9]. Educators, researchers, and businesses saw this huge advantage early on and began to convert educational context, real-world problems as well as business training into games. This category of games whose purpose goes beyond entertainment is called with an oxymoron term: "Serious Games".

Serious games have a history that can be linked back all the way to when the first video game was created. However, the industry did not receive much attention until 2002, when the report "*Serious games: Improving public policy through game-based learning and simulation*" [10] was released and then went on to become the impetus for the formation of the Serious Games Initiatives. In the same year came the public release of *America's Army*. It is a war game that showcases the military life created by the US army with the recruitment purpose, which becomes the most successful recruitment tool for the U.S. Army [11]. As of August 2008, the game was downloaded 42.6 million times and accumulated 9.7 million registered users from over 60 countries, as well as 230 million hours of playing time [12]. In the next decade, there was an exponential growth regarding serious games both in research and the industry [13].

As it is a hybrid between game and learning, the goal of serious games is to train and/or educate players while keeping them engaged and motivated throughout the game, so that, by the end of the game, the player is able to achieve the final learning outcomes, which would satisfy the stakeholder needs. Serious game venues come from the stakeholders while entertainment game venues come from the players themselves.

Serious games are becoming popular in many fields such as Education & Educational Research, Health Care Sciences & Services, Computer Science, Behavioral Sciences, etc. According to the findings from the report, serious game is mostly used in Education & Educational Research, in which history education is a subset of.

2.2 Literature Study

2.2.1 The power of stories and storytelling in learning

If we take a look at history, besides documents created by historians, stories has been used to pass down wisdom for the longest time. Stories that are personal and emotionally compelling engage more of the brain, and thus are better remembered, than simply stating a set of facts [14]. Nowadays, stories and the method of storytelling has been researched and apply to a wide variety of domains such as business, education, psychology, etc. Some of the major findings regarding the effect of stories on the brain are as following:

1. They help us relate to one another: Stories can increase our empathy by consistently causing oxytocin synthesis. Oxytocin is a hormone that is often known as the "bonding" or "love" hormone. This chemical substance is

produced when we are trusted or shown kindness, motivating cooperation with others. The hormone makes us feel close to the characters despite not having any physical or personal contact with them. In general, stories help us feel a greater sense of connection. [15][16]

2. They help increase neuron activity between the left and right sides of the brain: The left side of the brain is known to be associated with language and analysis, where data and facts are stored. This hemisphere of the brain is good at picking out patterns. The right side of the brain, on the other hand, is the center of creativity and intuition, which helps us see the big picture. A story - by having a cohesive structure that holds it together - stimulates the right side of the brain while also containing information that can be picked out by the left brain. "The increased neural activity helps us make more connections between the information presented and our existing knowledge. Stories thus make it easier for us to integrate new information into our experience." [16]
3. "They help us remember and integrate what we learn: Effective stories cause us to feel emotions. Emotions heighten our ability to memorize experiences and thus help improve information processing. Stories make it easier for our brains to store data for later retrieval. The more we relate to a narrative, the more likely we will be able to recall the information presented in a story." [16]

In the context of learning, storytelling if effective in many ways. Firstly, it can connect learners together. Good stories build familiarity and trust, and allow the listener to enter the story where they are, making them more open to learning. Good stories can contain multiple meanings so they're surprisingly economical in conveying complex ideas in graspable ways. [17]

Secondly, stories appeal to all types of learners. Paul Smith, in "Leader as Storyteller: 10 Reasons It Makes a Better Business Connection", wrote:

"In any group, roughly 40 percent will be predominantly visual learners who learn best from videos, diagrams, or illustrations. Another 40 percent will be auditory, learning best through lectures and discussions. The remaining 20 percent are kinesthetic learners, who learn best by doing, experiencing, or feeling. Storytelling has aspects that work for all three types. Visual learners appreciate the mental pictures storytelling evokes. Auditory learners focus on the words and the storyteller's voice. Kinesthetic learners remember the emotional connections and feelings from the story." [18]

Finally, the human mind remembers things as narrative. Psychologists found that learning which stems from a well-told story is remembered more accurately, and for far longer, than learning derived from facts and figures and that facts are 20 times more likely to be remembered if they're part of a story. [17]

2.2.2 Storytelling Games

Despite the ongoing debate over stories in games by game fans/designers/developer and scholars, there has been an increasing effort applied to creating meaningful and engaging stories in interactive media, especially digital games [19][20][21][22]. In the past, one major roadblock to having narratives in games is the technical limitations, which prevent players from feeling any real emotional attachment to video games [22]. However, this point is no longer seems to be valid as game technology has advanced significantly in the last decade, on all kinds of platforms, from gaming consoles to mobile devices and the web.

From the arguments of the debate, it should be acknowledged that not all games have to tell a story [19][20] as storytelling games are but a game genre among many others such as puzzle, action, sport, strategy, etc. Nevertheless, game narratives can support both competence and motivation, two key aspects of flow and game-play since it not only helps players do and do well, it can also make them feel they have a stake in why they're doing it [22]. Similar to other types of storytelling media such as movies, novels, etc., in games, time and space can be cleverly manipulated to give the player the best experience [21], and unlike other types of media, games have one major advantage in that it gives the player first-hand experience in the story itself. With the power of time and space manipulation, the game designers/developers have more freedom than ever to deliver multi-perspective and multi-chronological gameplay to the players by having them explore and encounter different story fragments in different orders in each playthrough, thereby increase the replayability of the game. This narrative design in storytelling games is known as *emergent narrative*.

Comparing to procedural narrative where the designer decides before-hand on the player's experience without letting the player think about any sort of consistent world simulations, emergent narrative gets so much more attention with its design flexibility and dynamics that allows players to actively explore and discover different part of the story and put them together piece by piece to form the whole puzzle.

From the industrial standpoint, emergent narratives are the goal of a narrative and/or game designer work. By using procedural narrative, meaning creating a bunch of little narrative bites, from tomes and flavor texts to dialogues and visual motifs then scatter them around the game for the player to find in any order, the story of the game emerges differently for each player. The way the player feels about the different story fragments and how they interpret the story as a whole would change based on the order they discover these story fragments. [23]

From the academic perspective, emergent narratives seem to be defined similarly. An author simplified the definition of emergent narratives by describing the term as a player's experience of a game, or rather the stories that a player has created playing a game [24][25]. Others described it as a construct '[...] arising of novel and coherent structures, patterns and properties during the process of self-organization in complex systems' [24][25] or as structures constituted by-, or

generated from, underlying processes of a user's experiences [24][25].

There are various ways to convey knowledge in a storytelling game. The information can be incorporated into the story plot or users' choices as they read through the game such as Choices of Robots, be delivered through tomes and books that are hidden in the game world waiting for the player to discover such as the game Horizon - Zero Dawn. The knowledge can also be embedded into the quests that the player have to complete as they proceed through the games, or via NPCs' dialogues like Genshin Impact, etc. These techniques can be govern wisely along with a good narrative to enhance players' immersion and motivation, enabling them to learn informally while playing the game.

2.3 Related Works

2.3.1 Gaming the Past: Designing and Using Digital Games as Historical Learning Contexts

This is a doctoral thesis whose aim is (1) to explore the suitability of video games as a medium for the representation of historical knowledge, and (2) to investigate the role digital games can play in fostering the meaningful understanding of history in formal educational settings. Following those aims, the work in this thesis was set to answer three main research questions:

1. Can digital games be considered a suitable medium for historical representation?
2. Which defining characteristics of digital games are relevant and advantageous for producing a historical representation?
3. How can historical digital games be designed to foster the meaningful understanding of history in formal educational settings?

Using a practiced-based methodology, the study is divided into many iterations experimenting with a series of game prototype for constriction and critical analysis. The author adopted the method of developing experimental historical game prototypes as an integral part of a process of "reflection in action" (Schön, 1985), shedding new light onto the problem of designing historical games with explicit educational purposes.

The research started off with a literature review whose first section provides the reader with background knowledge on the area of game studies including games, serious games and game-based learning. In the second section, the properties and affordances of digital games to generate immersive historical experiences were examined to extend the understanding of games as historical representation. The last section of the literature review looks into game-based historical learning, examining the practical experiences and theoretical developments in designing and using digital games in history classrooms.

Next, the arguments of why the use of the action-research through creative practice as the most appropriate method for the addressing of the investigation

aims and research questions were presented. The research strategy was divided into two phases: the first phase focusing in the iterative development and critical reflection of a historical game, and a second phase where the investigation moved to a primary school, where the final prototype was implemented and tested as part of the school curricular materials. Figure 1 shows table 3.2 from the thesis, showing a summary of phases, research methods used, research data and methods used to analyze the data obtained.

Table 3.2: Research methods, data and analysis frameworks for each phase of the project.

PHASE / SUB-PHASE	RESEARCH METHOD	RESEARCH DATA	ANALYSIS
Phase 1. Design process (Action research though practitioner action)			
Iterative game prototyping	• Experimental game prototyping	• Game playable demos and demonstration videos (Appendix A) • Development diaries (Appendix C) • Game production files (code, assets)	Auto-ethnographic methods
Expert evaluation	• Expert evaluation testing • Focus test	• Interview data	Thematic analysis
Phase 2. School implementation (Design-based research)			
Preparation	• Semi-structured interviews	• Interview data (Appendix E)	Thematic analysis
Pre-playtest	• Visual research • Semi-structured interviews	• Children's drawings and interviews (Appendix F)	Grounded theory
Play-test	• Visual analytics	• In-game data (Appendix G)	Player dossier (Medler, 2012)
Post-playtest	• Visual research • Semi-structured interviews	• Children's drawings and interviews (Appendix H)	Grounded theory
Wrapping-up	• Expert evaluation testing • Focus test	• Interview data (Appendix E)	Thematic analysis

Figure 2.1: Table 3.2 from author's work. Summary of methods used[26]

After presenting the research methodology, the author went on to describe the first phase of the study - the design and development process of the educational history game. The design decisions and work produced in each of the three stages are explained and followed by a critical reflection including a personal reflective examination of the personal design process; and the assessment of the work produced by expert reviewers collaborating with the project: historians, archaeologists, and history educators.

The first phase introduces the problem space where the audience and context of use for the game are explained along with the historical content overview to

lead up to the initial design goals of the prototype. Then, the author describe the solution space where iterative process of designing, refining design goals and getting feedback from the domain experts were explained. Finally, a critical reflection drawn from the development phase itself and the feedback received were given.

In the second phase of the study, the author described how the work from the final stage was put to play-test in a primary school using pre-test/post-test combined with game telemetry data collection method. In this phase, a school teacher accompanied the author through all of the research activities that were carried out in the school to provided support with structuring the session and ensured that the planned activities remained aligned with the curriculum goals. The preparation for the play-test was first conducted by having meetings with the teacher where the details of the implementation, along with the previous game-based learning experiences carried out by the school and the potential problems (e.g. ethical, technical, methodological, etc.) were discussed and reviewed. Activities done by the students in the history class are documented and the classroom space was also examined in order to prepare for the play-test. When the preparation is completed, a small activity were given to the student asking them to draw how they think life at that historical period was like and semi-structured interviews were conducted during and after the activity. The children's drawings and their interviews were recorded along with in-game information collected by the built-in tracking system to collect data. The drawing activity and mini-interviews were applied to both pre and post the play-test for comparison purpose.

After the implementation of the final game prototype was tested in the primary school, the data collected including preliminary interviews with the teacher, drawings and mini-interviews with students during the pre/post test, and in-game data such as survival time, movements, survival strategy and choice of dialogues (empathetic/non-empathetic) were themed and compared. The findings from the comparison and analysis were synthesized to conclude testing phase of the game prototype.

Before concluding the thesis, the author discussed the students engagement before, during and after playing the historical game. After that, they evaluated the game from a learning perspective and analyzed the particular ways in which it affected the children's preconceptions and naive understandings of the historical period. The most relevant themes from the pre and post playtesting sessions were also given a detailed examination and linked with relevant theoretical frameworks and comments obtained from the game's feedback sessions with archaeologists, historians and educators. The discussion also highlighted the most important learning moments and the author's reflection on the educational potential of video games as historical learning context.

This thesis offers an extremely useful insight on the process of developing a historical game. Albeit not going into too much details of technology as it is a thesis in a different field - psychology, it gave me an overview of what needed to be done, applicable research methods and some ideas of the areas that I should be focused on while working on my project. The work done by the author is detailed

and well-structured, which gave me a standard to set for my work in the upcoming chapters. This work also helped me scope my project, the work done in my thesis is very much similar to the first phase of this project considering the time constraint of only 6 months, although will not be as exhaustive. However, this project gave me a vision of a longer path for the thesis down the road.

Chapter 3

Design Process

3.1 Design brief

This section specifies the information that is going to be used as the game prototype content and the design goals that the game prototype will be aiming forward. The design brief provides a starting point for the development project in a later stage.

3.1.1 Audience and context of use

The primary purpose of the game, following the aim of this research, is to gain a better understanding of the aspects that determine the effectiveness of implementing the historical game in a formal learning context.

The game prototype conveys the information about Vietnam's resistance war against France in lesson 19 the history curriculum in the 11^{th} grade. Therefore, the audience of the prototype is 11^{th} grade (16-17 years old) students specifically. For this lesson, the learning outcome is defined as below, following the latest directive 5512 (see appendix A):

- Knowledge
    - The state of Vietnam before French invasion.
    - France attacked Da Nang, then took over 3 provinces in south east Vietnam.
    - The resistance war of Vietnamese people.
- Skill
    - Strengthen analysis, comparison, criticism and evaluate historical events and facts.
    - Have the ability to note connections, relate and learn from history.
- Attitude
    - Have pride over the culture of fighting off invaders of our ancestors.

    - Have the right perspective and awareness towards specific historical figures and events.

- General competence
    - Be able to understand the invasive nature of colonialism and its cruelty.
    - Be able to understand the responsibility of the Nguyen dynasty and the reasons that led up to the colonization of Vietnam at the end of the XIX century.

The chosen historical content for the game prototype is the reasons behind the French invasion of Vietnam in the 19th century. The topic was selected because of its complexity and numerous connecting factors that made it difficult for the teacher to convey in just one class. Additionally, lesson 19 is the first of six lessons in the textbook about Vietnam history, it lays the foundation for the students to understand and make connections of the whole process of why and how the people of Vietnam had to go through the resistance war against France. However, this lesson comes at the end of the school year when students are preparing for their final exams thus usually have less time and energy to invest into the topic due to the fact that history classes are often taken over by other STEM classes as presented in chapter 1.

According to the curriculum of this lesson, the teacher should be able to convey the reasons for which the colonization war between France and Vietnam occurred. The reasons are as the following:

- Subjective reasons:
    - Politically, in the mid-nineteenth century, Vietnam was an independent and sovereign country, but the feudal system was in crisis and seriously weakened.
    - Economically, agriculture deteriorated, there was frequent crop loss and famine (1). Additionally, the government was implementing the closed-door policy at the time, leading to suspension in industry and trading (2).
    - The policy and technology of the military in the country was obsolete and outdated, meaning Vietnam military was weak at the time.
    - In foreign affairs, Vietnam made a mistake by prohibiting Catholicism and banishing missionaries.
    - Socially, there were multiple rebellions against the Nguyen king in this period.
- Objective reasons:
    - Western capitalists and France specifically, entered Vietnam very early, by way of trade and evangelism.
    - French capitalists used Christianity as a tool of invasion. Bishop Ba Da Loc seized the opportunity for France to intervene in Vietnam when Nguyen Anh appealed to foreign powers to help regain power with

the Treaty of Versailles in 1789.
    - In the mid-nineteenth century, France advanced rapidly on the road of industrialization, seeking to attack Vietnam to compete for influence with Britain in Asia.

As the game prototype is planned to be used as a support tool for the lesson, some initial requirements were considered after requirement gathering discussions with the domain expert:

- *Level of complexity*. As the teachers and some students might be unfamiliar with technology and gaming, designing a game with simple mechanics and built-in introductions that can be understood even by first-time gamers is considered an important aspect.
- *Duration of the game*. Since the game prototype is developed as a historical media which can support teaching history, there is no fixed context where it can be applied. The discussions with the domain experts yielded that if the game were to be applied in a classroom environment, the expected duration is 5-10 minutes since the duration of the class is limited. In this case, the students would also need discussions and guidance from the teacher to go through with the lesson. On the other hand, if the game were to be played at home by the students, it can last around 30-45 minutes with more details to be able to cover more knowledge and also help the student contextualize the lesson they learned at school.
- *Game content*. Ideally, the game should not just be conveying knowledge from the lesson but also help students contextualize and make connections of information learned from the lesson. Additionally, the game language should be Vietnamese as English is not the primary language in the education system, teachers are generally not equipped to teach a foreign language.
- *Technology*. Considering the lack of technical skills of teachers and the varied specifications of computers used by both the schools and the students, the game should ideally be playable on an internet browser which requires no setup on the player's side.

3.1.2 Historical content overview

One of the secondary sources documenting this historical period is a national doctoral thesis submitted to the University of Paris in 1969 by Professor Cao Huy Thuan. In 1990, with the auspices of Yale University, the author published the thesis as a book in French with the title: "Les missionnaires et la politique coloniale francaise au Viet Nam, 1857 - 1914". The book was later officially translated in 1999 and published in Vietnam in 2002 with the title: "Giao si thua sai va chinh sach thuoc dia cua Phap tai Viet Nam (1857 -1914)". Until now, this is still the go-to book for anyone who wants to understand the history of Vietnam's loss of sovereignty in the 19th century.

In the book, the author describes how Western missionaries entered Vietnam by trade routes since the 16th century and were said to be the cause of multiple

rebels against the kings of Vietnam at the time, resulting in Vietnam kings' decision to suppress, expel and execute missionaries, leading to conflicts between Vietnam and France, which is the main reason for the invasion. In a series of letters and petitions sent to Emperor Napoleon III by high-status missionaries such as Évariste Régis Huc[1], bishop[2] Pellerin and priest Legrand de La Liraÿe[3], it was mentioned many times over that establishing a religious protection base which can be expanded into trading and economy in Vietnam would be the right thing to do which would yield many benefits for the people of Vietnam and emperor Napoleon III himself. In their letters and petitions, by settling in Vietnam, there were (1) political and strategic advantages in (a)cutting of British colonies and (b) having a maintenance base for French naval units in both trading and combating in South East Asia region; (2)economic advantages in dominating Vietnam's rare resources and (3)religious advantage in the fact that it will greatly enhance France's position in the church if Vietnam is converted to a Catholic country. Furthermore, the missionaries stressed that it is an extremely easy task as the people of Vietnam, who are kind, hard-working, and open-minded, are under extreme dictation from the lords, therefore would overjoyed if there was someone come to rescue them. [29]

Napoleon III's decision of invading Vietnam was under the influence of the political situation in the country. To establish a dictatorship, Napoleon III needed military successes that would signify national pride, while allowing him to reward his army and promote officers to whom he wanted to ensure loyalty. Additionally, he wanted to regain the attention of the Christians who supported him in his early career but then was driven away due to their fear that his sponsor of the unification of Italy would have disastrous consequences for the authority of the Pope. It was to draw back those Christians that Napoleon III wanted to satisfy them by supporting the demands of the missions in the Far East, reinforcing France's traditional status as "firstborn of the Church", as well raise the Emperor's prestige in the eyes of conservatives and Christians, as an Emperor who defended the right of his people. These preoccupations were the reasons why he was very sensitive to the campaigns and petitions that the missionaries sent to him.

Additionally, in 1787, during the Trinh–Nguyen Civil War[4], the Treaty of Ver-

[1]Also known as the Abbé Huc (1813–1860), was a French Catholic priest, Lazarite missionary, and traveler. He became famous for his accounts of Qing-era China, Mongolia (then known as "Tartary"), and especially the then-almost-unknown Tibet in his book Remembrances of a Journey in Tartary, Tibet, and China. He and his companion Joseph Gabet were the first Europeans who had reached Lhasa since Thomas Manning in 1812.[27]

[2]A bishop is an ordained or appointed member in a religious institution, who is generally entrusted with a position of authority and oversight.

[3]Théophile Marie Legrand de La Liraÿe was a French missionary in Indochina. Defrocked, he put himself at the service of the colonial administration, in particular as a translator and representative of the French authorities to the imperial court of Hue. He is the author of several books, including a brief history and the Vietnamese language, and an Annamese-French dictionary.[28]

[4]The Trinh–Nguyen Civil War was a 17th-century lengthy civil war waged between the two ruling families in Vietnam, the Trinh lords of Đang Ngoai and the Nguyen lords of Đang Trong, centered in today's Central Vietnam. The wars resulted in a long stalemate and century of peace before conflicts

sailles between France and Vietnam was signed when Nguyen Anh, driven out by Tay Son dynasty, ran to establish a base in Ha Tien and met bishop Pigneau de Béhaine (Ba Da Loc) who advised him to seek help from King Louis XVI, which he agreed. In return for king Louis XVI promised to help him to regain the throne, Nguyen Anh promised to cede Pulo-Condore (Con Son island) to the French and to give a concession to the French in Tourane(modern Da Nang), as well as exclusive trading rights. The Treaty of Versailles treaty marks the beginning of French influence in Indochina. However, the Governor of Pondicherry, Count de Conway, who was given authority to decide on the actual implementation of the Treaty, refused to follow through with it, leaving Pigneau de Béhaine to his means and rendering the Treaty to be invalid. [31]

However, Pigneau de Béhaine was able to muster a French force to support Nguyen Anh in acquiring sway over the whole of Vietnam in the period between 1789 and 1799. Later on, the French-based on the fact that Nguyen Anh did indeed receive support, sent emissaries to Vietnam demanding Nguyen Anh as well as his successors to fulfill the Treaty, to which the Nguyen lords refused time over time. Therefore, the reason behind the attack on Da Nang in 1858 which started the colonization was partially considered as a punishment to Vietnam for not fulfilling the Treaty of Versailles.

3.1.3 Initial design goals

A set of initial design goals were formed following the curriculum guideline, the domain expert input, the historical content to be translated into video game form, and related works. These goals will be served as broad guidelines for the prototyping phase of the project, and are purposely phrased in general terms:

1. **Design goal 1: To interact with people from the past.**
   The game should be able to bring the user into a world populated by agents with different opinions and perspective of the context in the selected historical period.
2. **Design goal 2: To convey historically based narratives of the chosen period.**
   To communicate narrative layers conveying factual and evidence-based historical information.
3. **Design goal 3: To encourage a critical reading of the game as a historical source.**
   The game needs to be considered as another interpretation of the past, not necessarily more valid than other representations of the same period.

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resumed in 1774 resulting in the emergence of the Tay Son dynasty. During the division of Vietnam, the Gianh River was used as the border between two regimes Đang Ngoai and Đang Trong. [30]

3.2 Specification design

The initial design was created to figure out a way to best convey the data gathered from the historical content, not considering the amount of workload to be done within the time limit of the thesis. After finishing the first design, a set of features that are considered critical to the game and are doable within the time limit were picked out to implement. This section will describe the original design and the scoped design respectively.

3.2.1 Original specification

As there are two main points of view on the topic of the France-Vietnam colonization war, the French side and the Vietnamese side, it was decided that there would be two separate games or at least two separate parts in one main storyline. Each part will depict one side of the story while having crossover artifacts and historical facts of the other side to form a link for the player to be able to connect the segments of information and form the whole story after playing.

On the Vietnam side, the player would be able to know the reasons behind the existence of French missionaries in Vietnam and their influences on the Nguyen Dynasty, which resulted in the strict laws that were released by the king to suppress and execute them. On the other hand, if the player chooses to play on France's side, they would know the historic, commercial, economic, strategic, and political factors that lead to the decision to colonize Vietnam of king Napoleon III. Each game has a different overview, objectives, flow, and mechanics, however, some basic gaming mechanics such as movement and interaction key are the same.

Common mechanics

- The game genre for both games will be 2D role-playing game (RPG) with pixel art graphics for portability and retro feel.
- The arrow keys is used for character movement as these keys are recognizable even for beginner gamers. In a later stage, support for WASD key will be added as they are the most popular keys for controlling characters' movement among gamers.
- Object interaction key is the space bar as it is the biggest and most convenient key to reach in any key combination.
- Quests: The game consists of multiple quests. Completing quests will allow the player to unlock information fragments and proceed with the storyline. Below are some quest types that can be in the game, further design is required to smoothly inject the quest into the game:
    - Path-finding: This type of quest requires the player to find the correct NPC or object(s) on the map. This quest is marked as completed once the player interacts with the NPC or the object(s). Directional guidance is given to the player by the quest giver (figure 3.1)

- Collect objects: The player will have to explore and find object(s) hidden on the map, the hint for object locations is given by the NPC who give the player the quest. Quest is completed when the player found all required objects on the map and returned it to the quest giver, an object is found when the player interacts with it. Hint of the whereabouts of the object is given to the player by the quest giver (figure 3.1)
- Puzzle solving: solve a puzzle to finish the quest, no hint will be given in this type of quest (figure 3.2)
- Combat: The player will have to defeat some NPCs in order to complete the quest. Combat style is either freestyle or turn-based.
- Stealth: This type of quest will require the player to stay undetected and reach a destination (figure 3.3)

Figure 3.1: An example of quest guidance from The Legend of Zelda: The Minish Cap

- Information and Collection
  - Information is gained after finishing quests or collecting items
  - Collection is divided into 2 tabs: information and item.
    - Information is what the player gain through quests, categorized by factors
    - Items are objects that the player may find when exploring. Some items are part of quests, some are not, but they all exist in the collection and will give the player some more information about

Figure 3.2: An example of a puzzle quest from The Legend of Zelda: The Minish Cap

the historical period as they discover them.
  - Collection have progress indicators showing the amount of collected information and items over the total respectively

  Figure 3.4 is an example of how item can be used to give information and figure 3.5 is an example of an in-game collection, where player can unlock different locations with in one area.
- Knowledge check
  - Occurs throughout the game as a mean to help the player review the information they have learned
  - All questions are multiple-choice, each question has three to four answers
  - The condition for passing a question is by having the correct answer
  - The player retry the knowledge check as many time as possible

France side design specifications

- Overview
  The player plays as a scout of the French Emperor who is sent to Vietnam and explores different regions to conclude the potential of Vietnam as a colony. The potential is defined based on 4 factors: strategic, political, economic, and religious (as mentioned in section 3.1.2).
  During the game, the player will get to talk to different NPCs, and unlock

Figure 3.3: An example of a stealth-based game from Disjunction

historical characters to acquire some extra historical knowledge and context of the period they are in. The player needs to complete quests of each region to receive clues of these factors and submit a report when leaving the region. In the end, the player will come back to the Emperor to report their findings, which will take place in the form of multiple-choice questions from the Emperor that they have to answer.

- Main objective: Gain all information through quests in order to submit reports and answer the king's questions
- Game flow: the game world consists of multiple scenes in which the player can move around and interact with. Each scene serves a different purpose, listed as below:

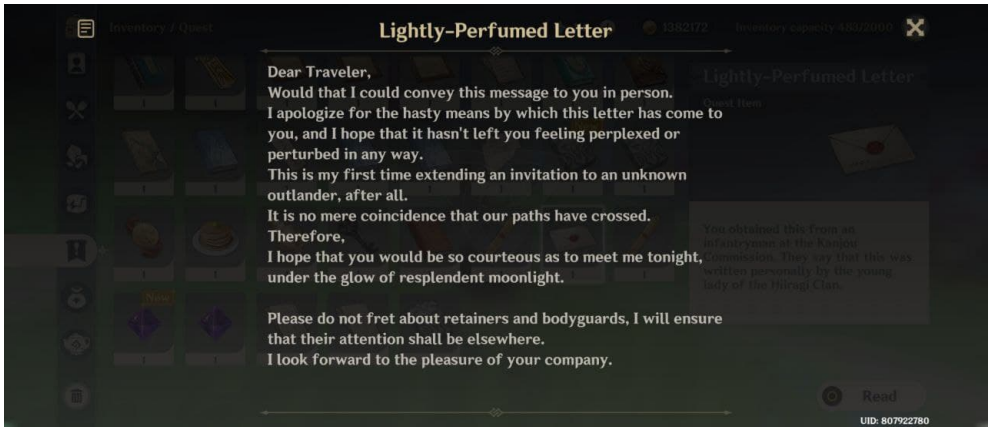

Figure 3.4: An example of an item in Genshin Impact

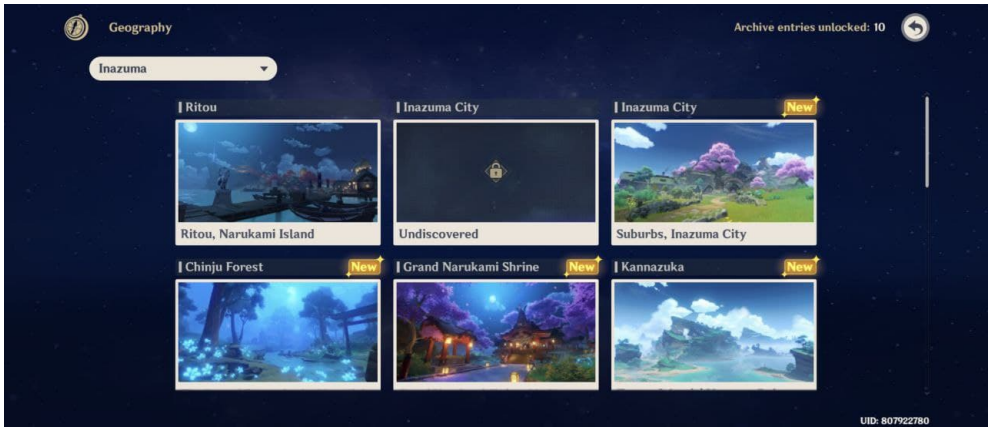

Figure 3.5: An example of a collection of locked/unlocked locations in Genshin Impact

- Game menu scene: select French and enter player name
- Black scene: run text of introduction about religion and France's current situation
- Play scene:
  - The player is summoned by the Emperor
  - Spawn player and introduce game interfaces and mechanics (eg. control keys)
  - Receive the first quest to find and talk to the Emperor
  - The player receives passports that allow them to enter different region from the Emperor. A passport will be consumed upon entering a region.
  - Introduce player's in-game items and how to access them: the journal for them to check their quest progress, a map to travel between regions, and their inventory
- Region scene (Loop until visited all regions):
  - Hint to open the journal to get information about the quest of this region
  - Upon finishing all quests of the region, prompt a dialogue to inform the user to move to the next region or go back to the Emperor if there is no more passport available in the player's inventory
- Castle scene:
  - Hint the player to talk to the Emperor
  - When player chooses to talk to the Emperor, they will receive a quest to answers a series of questions from the Emperor about the information that they discovered. This is a knowledge check.
- Summary scene:

        - Summarize the main knowledge points of the game
        - Display the player answers to the questions for each try
- Mechanics
    - Rules
        - There is no lose condition
        - The French side is completed when the player passes the knowledge check by the Emperor
    - Regions and report
        - There are 3 regions in Vietnam that the player has to explore
        - Each region can only be entered once using the passports obtained from the Emperor at the beginning of the game
        - After finishing quests in all regions, the player has to report to the Emperor as a method to sum up what they has gained through the exploration

Vietnam side design specifications

- Overview
  In the game, the player will go through the timeline of the first 4 generations in the Nguyen Dynasty. Starting with king Gia Long's (Nguyen Anh) era, through Minh Mang, Thieu Tri and finally Tu Duc's era. Each era will be a chapter in the game.
  By interacting with the environment, NPCs, and doing quests in each era, the player will be able to get an insight of how missionaries were treated, what did the Vietnamese think about them and how the kings of the Nguyen dynasty had to resolve to such strict restriction towards them.
  As the information of this part is more complicated, the player knowledge with be tested after each era, and once again at the end as a summary.
- Main objective: Gain all information through quests to get pass the knowledge test at the end of each chapter and complete the story line.
- Game flow: the game world consists of multiple scenes in which the player can move around and interact with. Each scene serves a different purpose, listed as below:
    - Game menu scene: select Vietnam and enter player name
    - Intro/outro scene: contains a short introduction/conclusion of the game chapter, will appear before the player starts/finishes a chapter. The player finishes a chapter when they manages to correctly answer all of the questions
    - Chapter scene:
        - Hint to open the journal to get information about the quest of this chapter
        - Upon finishing all core quests of the chapter, the player can choose

to answer the questions and proceed to the next chapter or keep exploring the current world.

- Summary scene:
  - Summarize the main knowledge points of the game
  - Display the player answers to the questions for each try

- Mechanics
  - Rules
    - There is no lose condition
    - The Vietnam side is completed when the player manage to get pass all knowledge checks for each chapter as well as the final check at the end of the game
  - Era: An era can be seen as a mini-world with in the game world. During an era, the player has the freedom to travel to different regions to explore and unlock information for as long as they want. They will only move to another era if they select to trigger the final quest for a knowledge check.

3.2.2 Refined specification

The specification in subsection 3.2.1 is the first estimation of features and content to cover the selected historical topic. However, it is too complicated to finish within the time of this thesis, therefore, it is stripped down to a few core features that are implementable within the time limit.

The story on France's side is selected to implement as it is more straightforward than Vietnam's side. Below are some core features to be implemented in the context of this thesis:

- **Object and NPC interaction:** the player should be able to interact with the NPC to unlock necessary information on their adventure. Interacting with objects and NPC simply trigger a dialogue to give the player information.
- **Map and regions:** The player should be able to travel between regions by selecting the region on a map
- **Information log:** There should be a way to inform the user about the total amount of information they need to acquire and the amount of information that they have already discovered
- **Knowledge check:** The should be a way for the player to test their knowledge at the end of the game. Following the specification in subsection 3.2.1

Chapter 4

Development and Implementation

4.1 Game technologies for the web

As mentioned in section 1.1, the history teachers have limited knowledge regarding technology and are more comfortable with a product that is lightweight and requires little to no setup. Therefore, the prototype will be developed on the web for accessibility and ease of use. With that said, this section explores some of the technologies that can be used to develop the prototype.

Frameworks and Game Engines

A framework is a platform for developing software applications. It provides a foundation to build software on a specific platform. A framework usually includes pre-defined classes, has supporting features to help streamlines the development process of a certain type of software, saving the developers time from having to reinvent the wheel every time they start building new software. Besides having an API (application programming interface) that provides access to the features of the framework, a framework may also include code libraries, a compiler, and other programs used in the software development process. [32]

A game engine is software that contains a set of visual development tools and reusable software components. It provides an abstraction layer over core features such as graphics rendering, sound reproduction, asset management, collision detection, physics simulation, etc., allowing the developer to focus more on higher game logic and interaction. Game engines usually have their own ecosystem, with built-in IDE and graphical design and rendering UI. [33]

Frameworks and engines are very similar at first glance, but in fact, are very different. A framework is a "foundation" or "support structure" around which you build your actual application. Frameworks provide a relatively static, generic structure on and in which you build something specific and unique. An engine is a self-contained, but externally controllable, piece of code that encapsulates

powerful logic designed to perform a specific type of work. Engines exist to do "heavy lifting", where you instruct it to perform some complex, abstract task, and it handles the specifics in a relatively efficient manner without further external guidance. One could say that an engine "does the job for you" while a framework "simplifies your job". [34]

Web game frameworks, specifically speaking, are still quite young considering that web games were mostly built using Flash in the past. However, with the establishment of HTML5 and the official demise of Flash in 2020, it is now the time for games built using Javascript and HTML5 to take over as the basis for web browser games. A quick search on Github reveals a dozen of web game engines and frameworks such as Pixijs, Phaser, melonjs, etc. Additionally, popular game engines like Unity and UnrealEngine has provided support for games on the web platform with Unity WebGL and UnrealEngineHTML5.

To me, a framework takes less time to get used to since I can use the code to control any behavior or logic through its API, while with an engine, besides knowing how to program, one also has to know how to navigate and govern the elements within the engine along with its own terminology to be able to be efficient enough. Below are some frameworks and engines that I have experimented with when working on the game concept design.

Phaser.io

Phaser is a web game development framework for canvas and WebGL-powered browser games that incorporates all of HTML5 latest technology. It is lightweight and easy to set up. The development language of Phaser 3 is Javascript, the most popular language for web development hence it can run on web browsers of any gaming platform. It has detailed documentation of all of its APIs along with an intensive amount of game examples to learn from. Phaser is suitable for games with simple 2D graphics and simple mechanics that don't require much computational power, for example, games such as To The Moon or Super Mario. However, it requires a moderate amount of programming as Javascript is used in everything in Phaser.

Interactive fiction frameworks

Games such as Choices of Robots or The Frankenstein Wars rely heavily on narrative to keep the players engaged as these games are mostly text-based that requires the player to read through and make moral choices based on the information they have acquired. These games only need a framework that supports dialogue branching and does not at all require programming experience. Twine, Quest, and Inkle are among the most popular choice for these text-based games. These kinds of frameworks, although possible to add images and sound, their core purpose is to enable writers to create games that emphasize the visual structure of hypertext. Twine, Quest, and Inkle are all available on the web, Twine and Quest also have a stand-alone desktop application. The games created from these frameworks can

be easily exported as HTML pages that can be deployed on any browser. The data can also be exported as JSON files to be used in other types of games. These frameworks are regarded as a tool that can be used by anyone interested in interactive fiction and experimental games. Figures 4.1 and 4.2 show the user interfaces of different tools that I've examined.

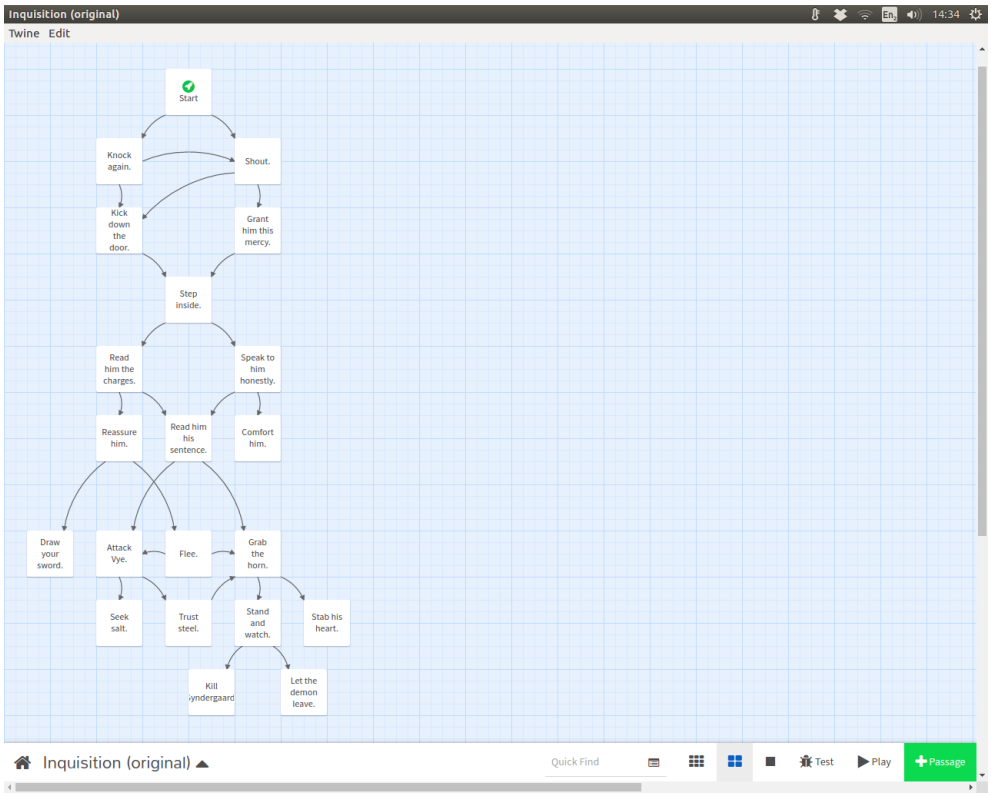

Figure 4.1: Twine's user interface [35]

Unity WebGL

Unity has been one of the most popular game engines around in the game industry. It was released back in 2005 and is now supporting over 25 platforms, the web included. Besides the dynamic in gaming platforms, Unity is also well-known for enabling developers to develop all types of games, from 2D, 3D to virtual reality and augmented reality games. Unity comes with a highly responsive IDE that allows game developers to build games with little programming effort and an assets store to get plugins and graphics from. The latest version of Unity also supports the latest web technologies such as WebGL, WebRTC, etc. Although programming is required, Unity does offer support in rendering graphics in its IDE without involving any programming, the developer only has to program the game logic. Unity is an excellent choice for games with complex functionalities

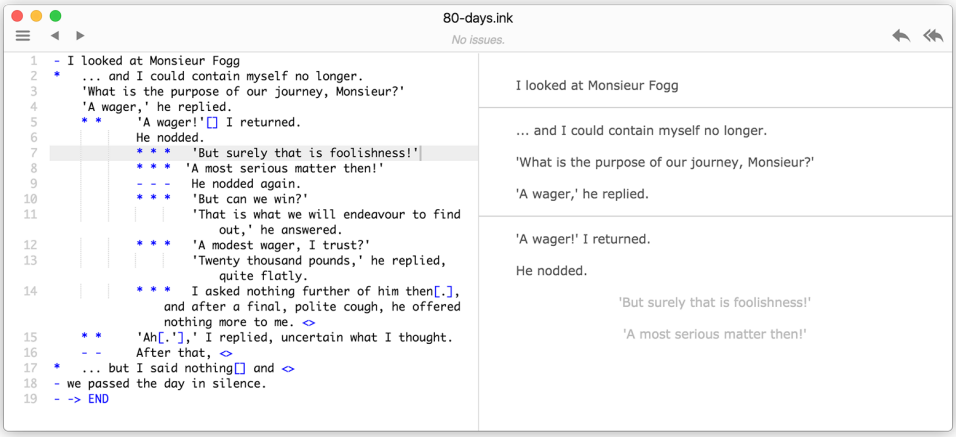

Figure 4.2: Inkle's user interface [36]

and high-quality graphics that requires extensive calculation such as the game Horizon - Zero Dawn.

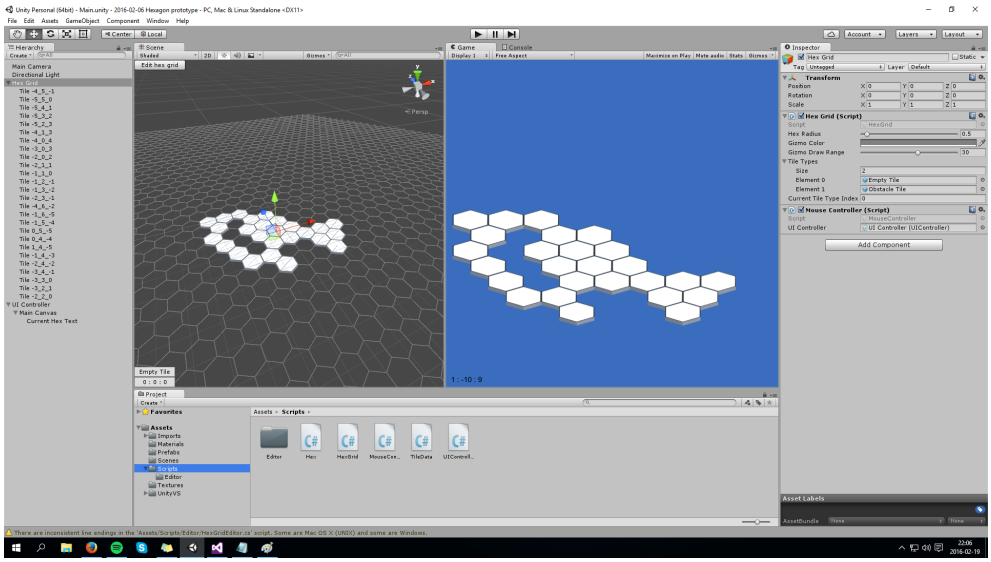

Figure 4.3: Unity's user interface

Game design tools

Compatibility is crucial for software development, especially game development. Unless using a game engine where the design tool is built-in and all components are compatible with each other, developers and/or designers will need another software to produce the art and sounds for the game. It is fundamental to find game design tools that produce compatible resources with ones that are supported

by the framework.

Below is one of the few tools that I have looked at when finding the tools for the game design phase. The character sprite sheets and terrain tilesets were bought from *itch.io*, a website that contains game resources for developers.

Campaign Cartographer 3+

Campaign Cartographer 3+ is designed to draw maps for role playing and miniature war games. It is an improved version of Campaign Cartographer 3 and support and great range of functionalities for map design.

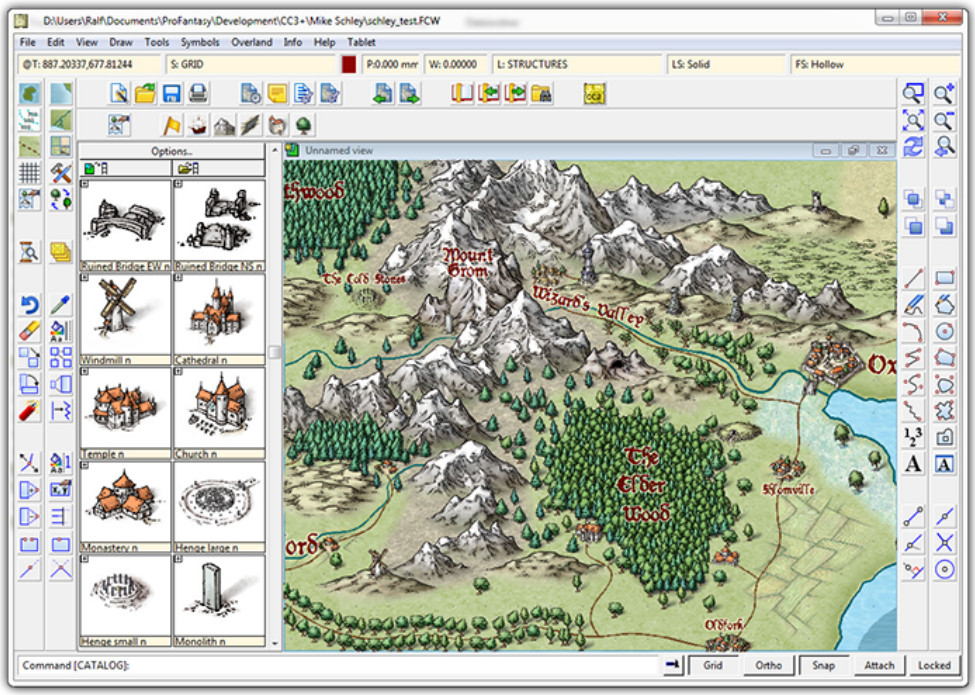

Figure 4.4: Campaign Cartographer 3's user interface

Tiled

Tiled is an open-source 2D level maker tool that is compatible with Phaser 3. It is popular among game designers for its dynamic and simplicity. It supports multi-layer tilemap and configuring tile properties which are extremely convenient when building a world. It also supports object layers, which allows developers to set the position of the character or items on the map before rendering the graphics in using programming.

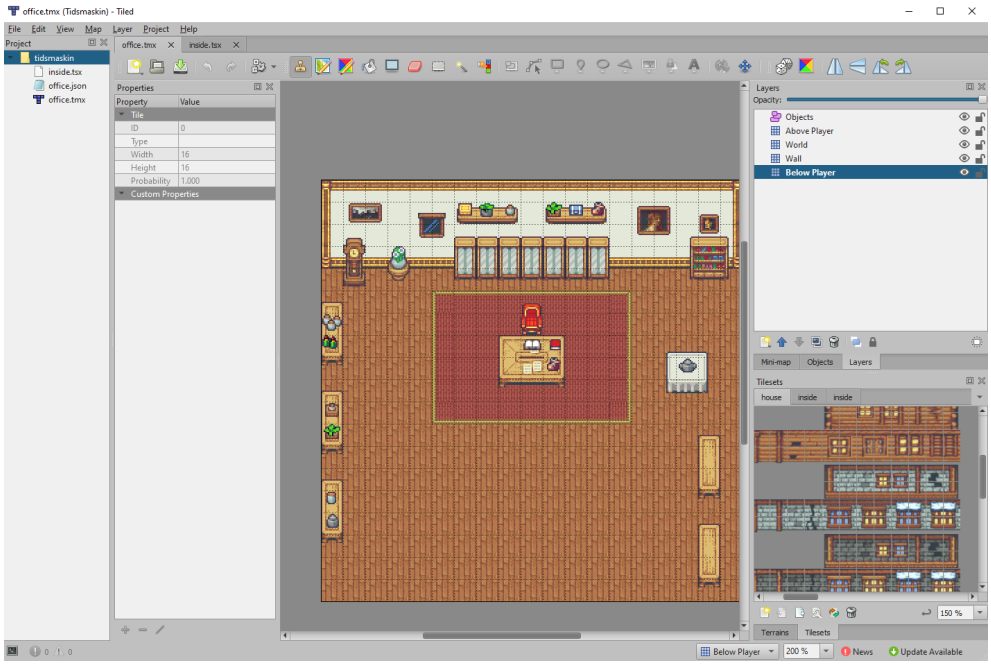

Figure 4.5: Tiled's user interface

Storage

Most major modern websites are dynamic — they store data on the server using some kind of database (server-side storage), then run server-side code to retrieve needed data, insert it into static page templates, and serve the resulting HTML to the client to be displayed by the user's browser.

Client-side storage works on similar principles but has different uses. It consists of JavaScript APIs that allow you to store data on the client (i.e. on the user's machine) and then retrieve it when needed. This has many distinct uses, such as:

- Personalizing site preferences (e.g. showing a user's choice of custom widgets, color scheme, or font size).
- Persisting previous site activity (e.g. storing the contents of a shopping cart from a previous session, remembering if a user was previously logged in).
- Saving data and assets locally so a site will be quicker (and potentially less expensive) to download, or be usable without a network connection.
- Saving web application generated documents locally for use offline

[37]

Mini-games with short-lived sessions and simple mechanics usually use client-side storage while games with longer playtime and complex computing tasks usually make use of server-side storage as more data can be properly processed and stored on the server compare to the client.

Client-side storage

There are several other storage mechanisms available in the browser, but they have limited use and may cause significant performance issues. [37][38]

Cookies along with some other types of client-side storage such as SessionStorage - a tab-specific storage, and LocalStorage can only contain strings, are limited to only 5MB space and cannot be accessed by web workers [1] or service workers [2]. Additionally, SessionStorage and LocalStorage are synchronous and will block the main thread, meaning the browser will freeze while the data is processed. [37][38]

There have been attempts at supporting more complicated data formats like objects and files. The File System API and FileWriter API provide methods for reading and writing files to a sandboxed file system. While it is asynchronous, it is not recommended because it is only available in Chromium-based browsers. The File System Access API was designed to make it easy for users to read and edit files on their local file system. The user must grant permission before a page can read or write to any local file, and permissions are not persisted across sessions. [37][38]

There were several limitations when it comes to storing data in clients. Thankfully, the release of Cache API and, especially, IndexedDB made it possible to store large amounts of data on the client side. While can be used as a general storage mechanism, the Cache API is a system for storing and retrieving network requests and their corresponding responses, which can significantly enhance the response time by enabling service workers to cache network requests. Finally, the most suitable candidate for data storage is IndexedDB, a low-level API for client-side storage of significant amounts of structured data, including files/blobs. This API uses indexes to enable high-performance searches of this data. IndexedDB and the Cache Storage API are supported in every modern browser. They're both asynchronous, and will not block the main thread. [41][42]

Server-side storage

Server-side storage has long been the go-to option for web applications that require storing sensitive and complex-structured data. This is the preferred method because the data can be accessed from the client with minimal delay and is secured by the service providers thus lightening the load for the developers. However, using server-side storage usually comes with extra cost as the developer rents a machine to store data on the server of the data provider.

Big service providers such as Amazon or Google offer the developers a significant amount of options to store data. For example, Amazon Web Service has

[1] A web worker is a JavaScript that runs in the background, independently of other scripts, without affecting the performance of the page [39]

[2] A service worker is a JavaScript that runs in the background, independently of other scripts, without affecting the performance of the page. Different from web workers, service workers allow you to intercept network requests and to listen for Push API events in the background [39][40]

S3 as file storage, RDS as a relational database service and DynamoDB as a non-relational database (key-value storage) and Google has Firebase, an all-in-one platform to create mobile and web applications with Cloud Storage for containing files, Cloud Firestore, a NoSQL database for data storage and Real-time Database for better synchronization between client and server.

The advantage of using a pre-defined platform by the service providers is that it requires very little effort to set up the development environment and the developer does not have to worry about compatibility as all services are within one ecosystem and will always be compatible with each other. However, besides the cost, a disadvantage of relying on a pre-defined platform is that the options are limited to only what the platform offers.

Another option is to use a hosting service where the developer can rent a machine and set up their own database on that machine such as MySQL or Postgres, which can be accessed remotely. This requires extra setup and that the developer needs advanced knowledge of web application development to ensure all components of the project run smoothly. The developer also has to maintain the server on their own.

Deployment tools

Git

Git is software for tracking changes in any set of files, usually used for coordinating work among programmers collaboratively developing source code during software development. Git is now integrated with many hosting and project management services (Heroku, Github, Bitbucket, etc.) as it becomes a worldwide tool for source code management. Developers use git to upload their code to the cloud, avoiding losing their work should anything happens to their local machine.

Heroku

Heroku is a container-based cloud Platform as a Service (PaaS). Developers use Heroku to deploy, manage, and scale modern apps. Heroku is fully managed, giving developers the freedom to focus on their core product without the distraction of maintaining servers, hardware, or infrastructure. Heroku runs the app in lightweight, isolated Linux containers called "dynos". They offer a free plan which has 550-1,000 dyno hours per month with 512MB RAM and Git integration.

4.2 Selected Technology

The technology stack used in this project including:

- itch.io is used for game resources like spritesheets and tilesets.
- Tiled is used for designing maps of the prototype using resources from itch.io

- Phaser 3 is used as the framework for the game prototype.
- Javascript is the main programming language for the game prototype, a little bit of Nodejs is used to deploy the game to Heroku.
- JSON files are used in the game prototype to store information about characters, narratives, and configurations.
- Heroku is used as a host where the game prototype is deployed to.
- Github is used as a project management tool (see figure 4.6).

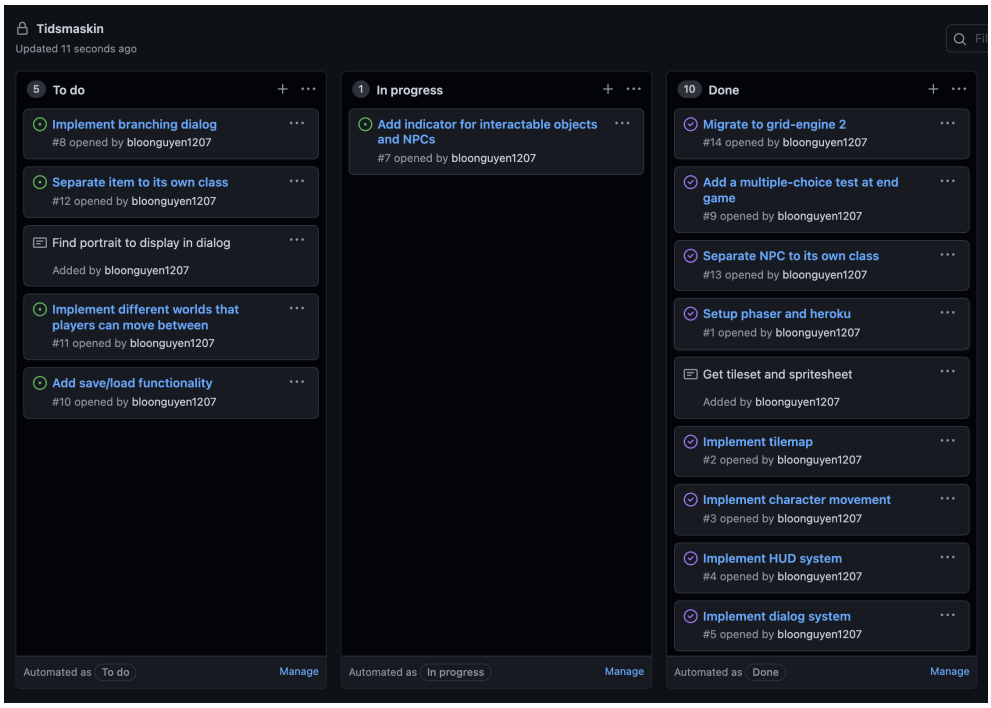

Figure 4.6: The project board on Github

4.3 Implementation

The implementation process of the game prototype is divided into 3 main phases. The first phase focuses on the game graphics, story, and narrative designs. The second phase focuses on the technical side of the prototype, combining the designs in phase 1 into an interactive 2D world. The third and final phase focuses on improving the user experience, adding more elements to introduce the main quest and interaction system (eg. how to move the character, how to interact with an object) as well as indicators to let the player know which object in the prototype they can interact with. The link to the game prototype's source code and playable version online can be found in appendix C

4.3.1 Game element designs

In the game, all of the scenes that contain tilemaps were built using Tiled with customized properties to be used when plugging them into the game framework. A few extra tools were experimented with and used to produce the resources to be used in Tiled.

Besides graphic design, time was also spent on narrative design as game narrative is one of the most important parts of storytelling games. Despite having filtered out all of the key information, the narrative has to be balanced between different points of view in order to avoid cultural bias in the game. This does not mean all characters in the game have to maintain this balance separately, but instead, each of them contributes to the whole balance of the game.

Figures 4.7 - 4.11 are the tilemaps created for the game prototype using Tiled

Figure 4.7: Tilemap for Home Scene

Figure 4.8: Tilemap for Office Scene

4.3.2 Game flow design

The game prototype consists of multiple scenes serving different purposes: providing background knowledge, presenting the game controls, etc. Figure 4.12 shows a simplified version of the game flow. The game flow was developed and improved parallel to both the design and development process.

A detailed walk-through of the game flow is presented below in the form of scenes. In the game, each screen context switch(eg. transition from the preload page to the introduction page) is a scene.

When the game starts, there is a preload scene (figure 4.13) showing the player the process. After that, two initial scenes were added with the intention to implement a time-shift to bring the player from the modern era back to the 19^{th} century where the historical events occurred. The first scene, which is called the Home Scene (4.14) depicts the player as a student trying to study for their

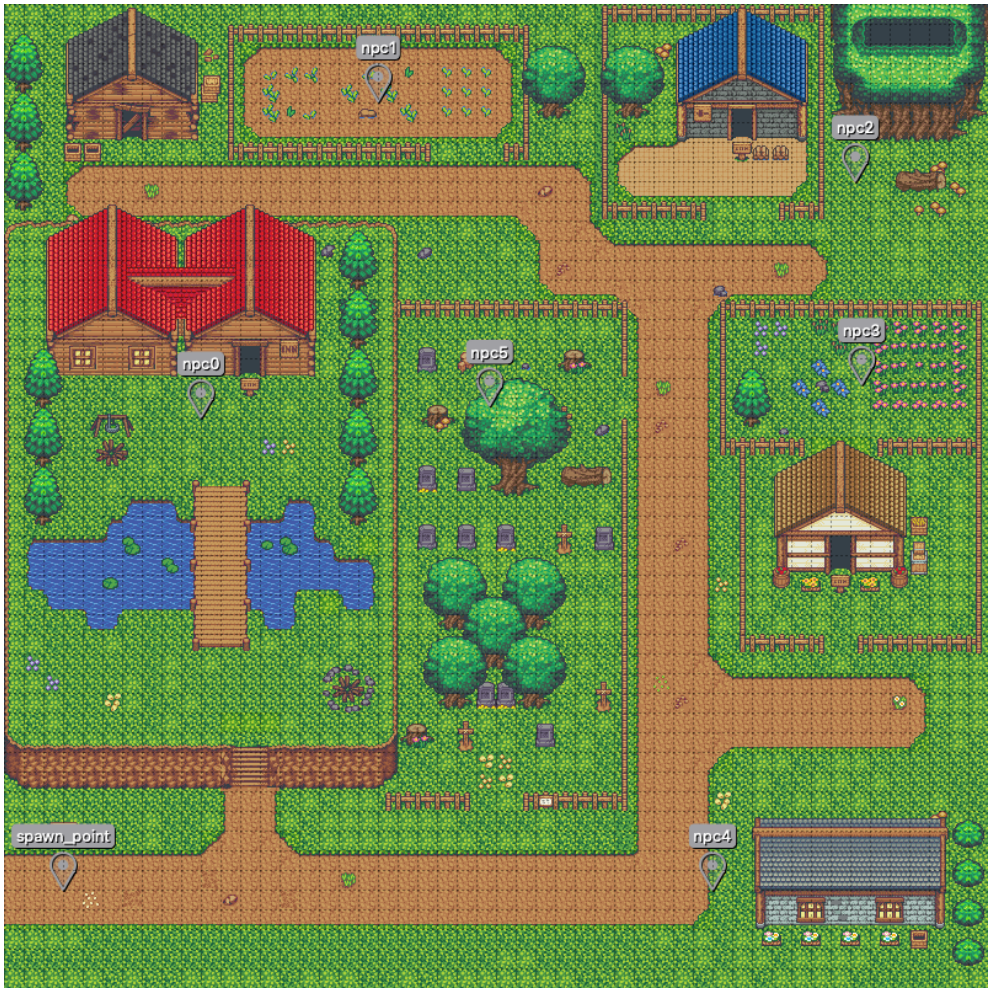

Figure 4.9: Tilemap for Town Scene

history exam but finding it hard to study, then decided to take a nap. This is to establish a connection between the character in the game and the player, make them feel like part of the game. There is no interaction in this scene, only dialogues by the player to set the scene.

After the player fell asleep, they will wake up in the second scene where they are now a character in history, the scene is called Office Scene (4.15). This scene contains interactive objects and NPCs that the player can gather information from. In the first version, the scene was intended only for the initial context of the historical period and quest introduction. The player triggers the main quest after talking to the NPC of this scene and is transitioned into the next scene, where they can start their journey.

The Home and Office scenes are replaced with a short background introduction and control tutorial scenes in the second version following the domain experts' feedback from the first version (figures 4.16, 4.17)

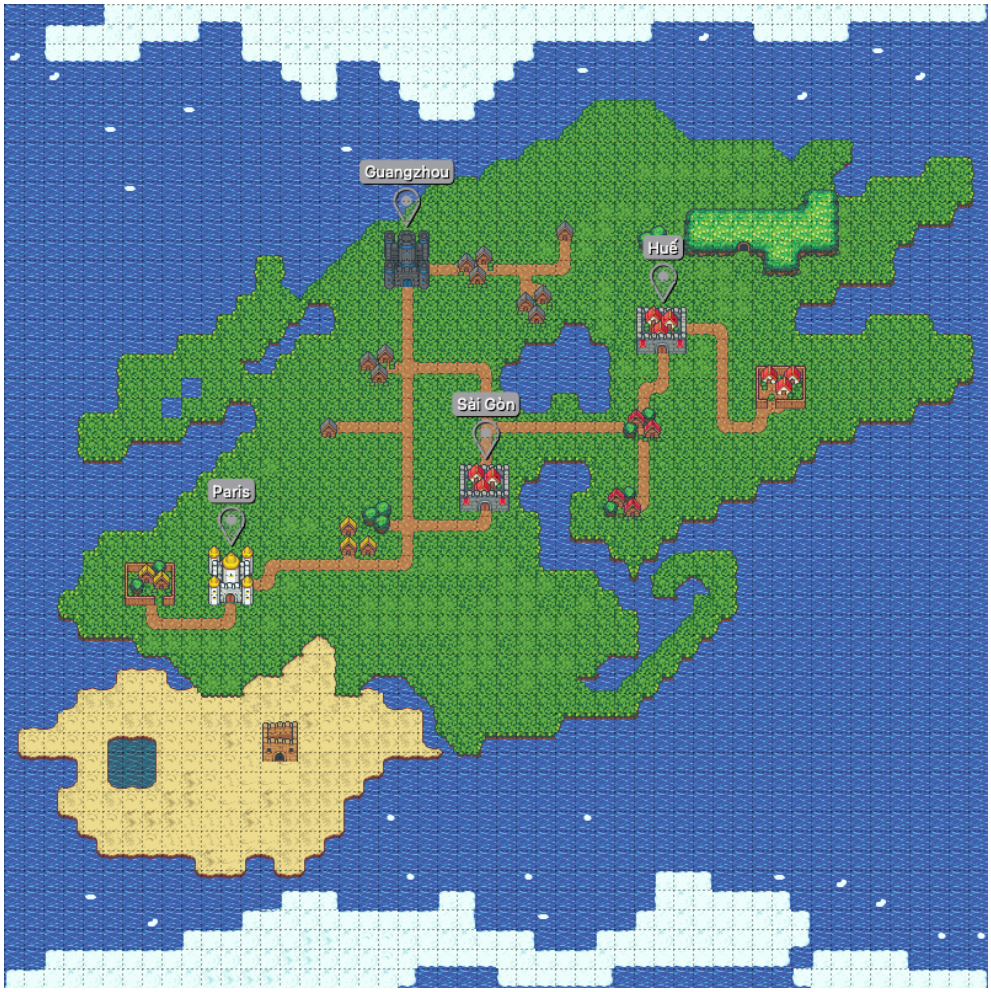

Figure 4.10: World tilemap - used in Map Scene

The main part of the game consists of two scenes overlapping each other(figure 4.18). One is a normal tilemap where the player can walk around and interact with objects and NPC, this is called the Town Scene. On top of the Town Scene is the HUD Scene [3], which provides access to the journal where the quest progress is stored and updated. There is also a map functionality that connects to the Map Scene, showing the player other locations they can travel to in order to advance the game. However, the current version of the game has only one playable location. More details about the map and the journal implementation are provided in the game features section below.

After unlocking all information in the journal, the player is transitioned into

[3]the HUD (heads-up display) or status bar is the method by which information is visually relayed to the player as part of a game's user interface. The HUD is frequently used to simultaneously display several pieces of information including the main character's health, items, and an indication of game progression (such as score or level). [43]

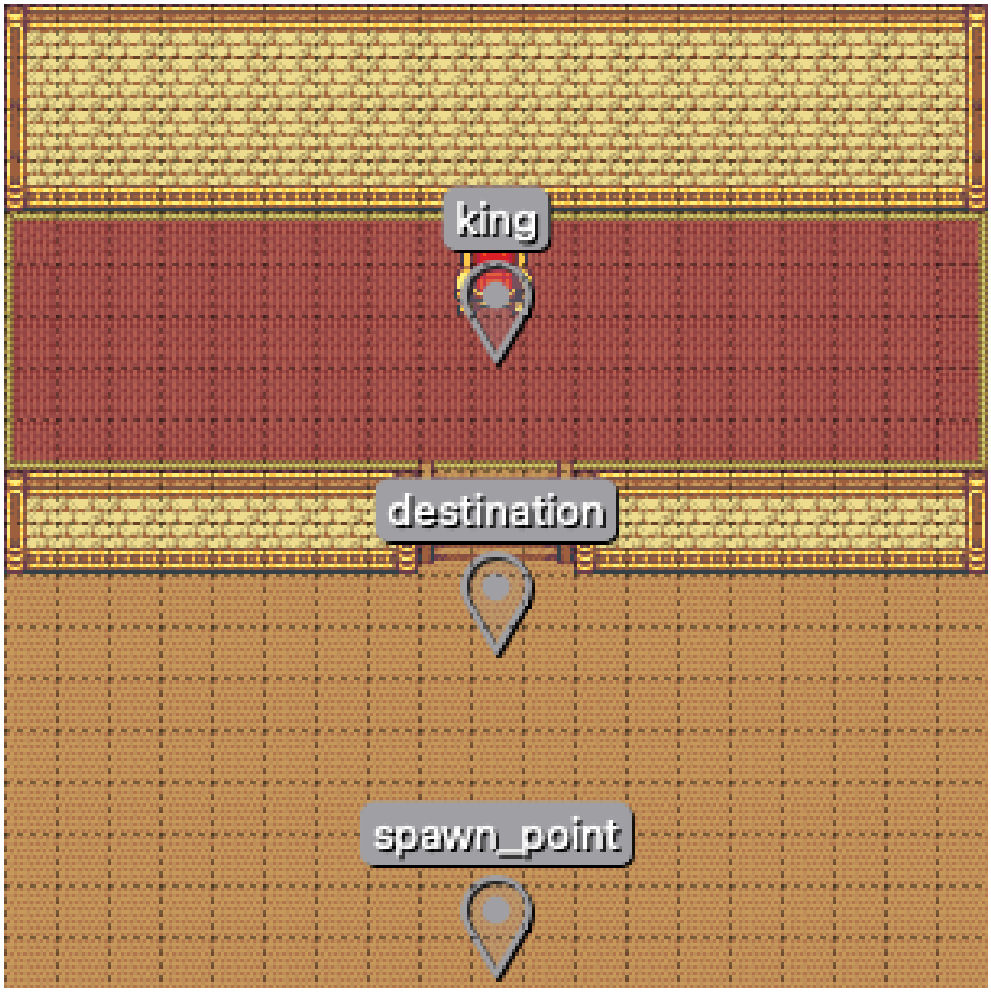

Figure 4.11: Castle tilemap - used prior to Quiz Scene

the final scene where their knowledge is tested by answering questions by the Emperor. There is no scoring system, instead, the player can choose until they get the correct answer(figures 4.19, 4.20).

4.3.3 Game features development

The development process contains two main phases. The first phase focuses on the core features of the game such as character movements and collisions, dialogues, quests, knowledge logs, and tests. The second phase was less focused on technology but more focused on improving the player experience like re-organizing the game content, providing more in-game guides and feedback to help the user take in the knowledge easier. This section goes more into the technical details of the implementation, describing the process of developing the core game features. The experience from the prototype development process along with technical dif-

Figure 4.12: Game flow overview

ficulties and reflections will also be presented in this section.

Movement system

Despite having made a few mini-games using Phaser, I have never built one with a complex collision and feedback as this project. In addition to make the player move, I also had to control different object layers and collision to provide an accurate world feel to the player. After a week trying to implement the movement system, I discovered a Phaser movement plugin - *grid-engine* developed by Annoraaq - that just got released and decided to make use of it. The plugin took care of the implementation of player collision and layer controls by making use of tile properties that can be provided from Tiled when designing the tilemap. This plugin provided significant support in the development process of the movement system.

Interaction system

The physics system of Phaser has a limit in collision detection which makes the job so much more difficult than I expected. Due to the unexpected complexity of the interaction system, the method which the user can use to obtain information is limited to triggering a text dialogue. The obstacles in the implementation process of the interaction system are mainly about resolving conflicts between interactions and developing a correct method to detect collision end between the player and the game objects to terminate the interaction process between the two. The interaction system is one of the features that took the most of the development time due to the limitation of Phaser's built-in physics implementation. The flow of the interaction system is shown in figure 4.21.

Dialogue system

The dialogue system was developed from scratch as Phaser does not have built-in support for this functionality. This system is developed as a Phaser plugin utilizing Phaser's event subscribing and publishing functionality and is linked to the log

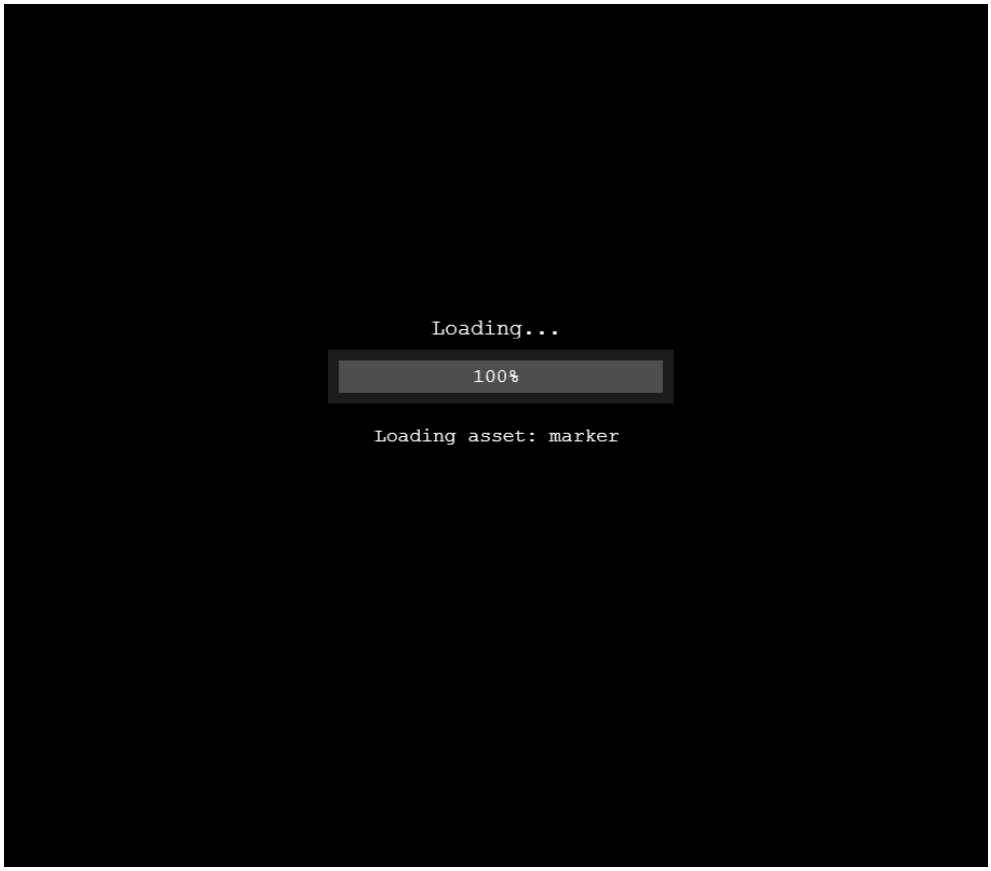

Figure 4.13: Preload Scene - Show resource loading process when the game initiated

system to allow the player to unlock log entries upon completing certain dialogues. Figure 4.22 shows the class diagram for the system.

Some time was dedicated to investigating different forms of dialogue as it can significantly affect the way the story is conveyed throughout the game. However, I decided to implement the simplest form of dialogue - single branch dialogue - in this prototype and extend it to multi-branch dialogues if time allows. Unfortunately, implementing the base for the dialogue system took more than expected as very few people have implemented a similar system before in Phaser. A lot of time was spent on trials and errors as I have to design the system as I implemented it. After finishing the basic system that supports single-branch dialogue, I had to move on to other features and did not have time to come back and improve this further.

Map system

The map is created to give the player the ability to travel to different regions to experience the different mindsets and cultures during the selected historical

Figure 4.14: Home Scene

period. Implementing the map is pretty straightforward with the support of the framework.

Log system

The log system is implemented by hooking the achievement to the dialogue. When a player completes a dialogue that contains an achievement, it will unlock the corresponding entry in the journal as well as display a popup box to let the player knows they have just unlocked an achievement. The player can also revisit unlocked information using the journal. The log system is shared across all playable scenes.

Figure 4.15: Office Scene provides the player with context and game controls

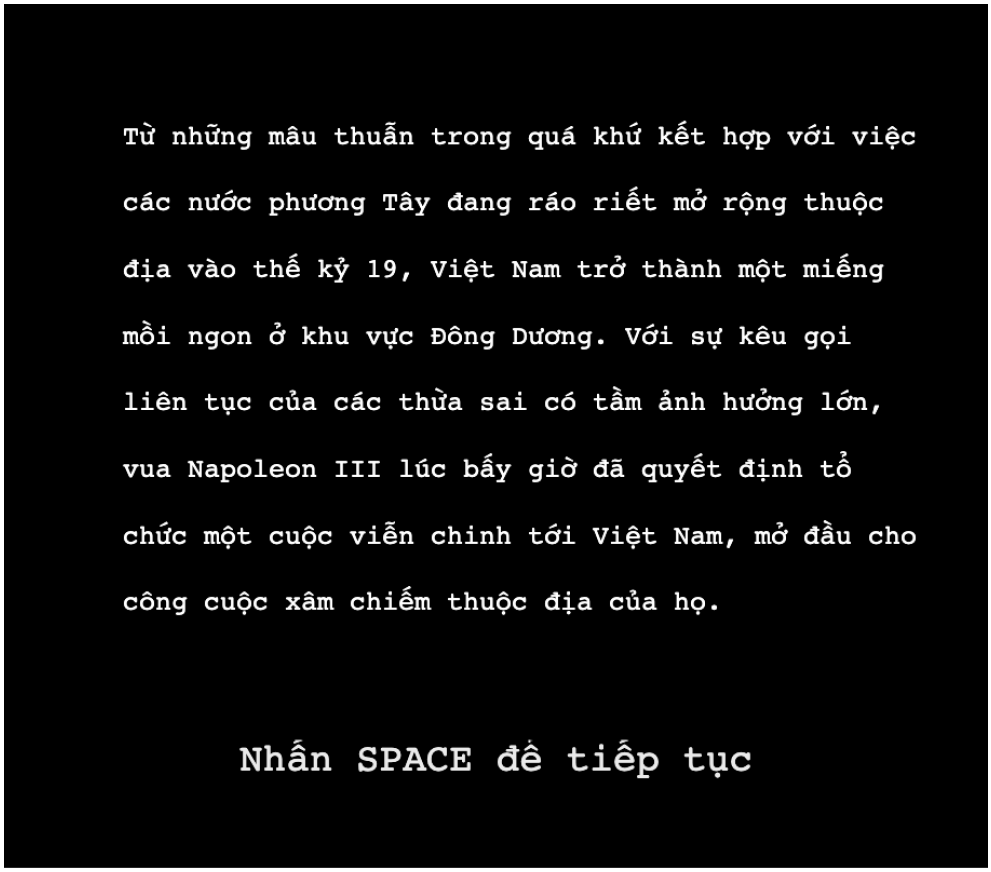

Figure 4.16: Introduction scene provide the player with background knowledge and the role the player is going to play as

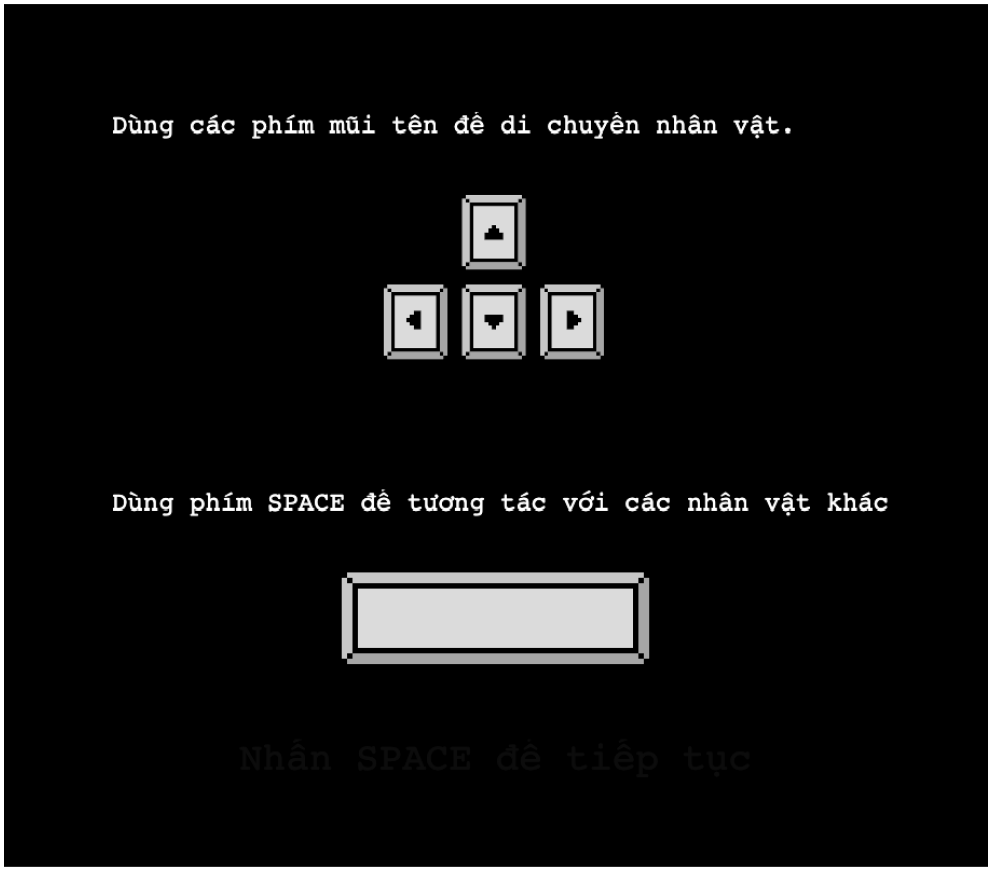

Figure 4.17: Tutorial scene show the player how to play the game

Figure 4.18: Town Scene with overlaying HUD

Figure 4.19: Castle Scene - Cut scene before entering the final quiz

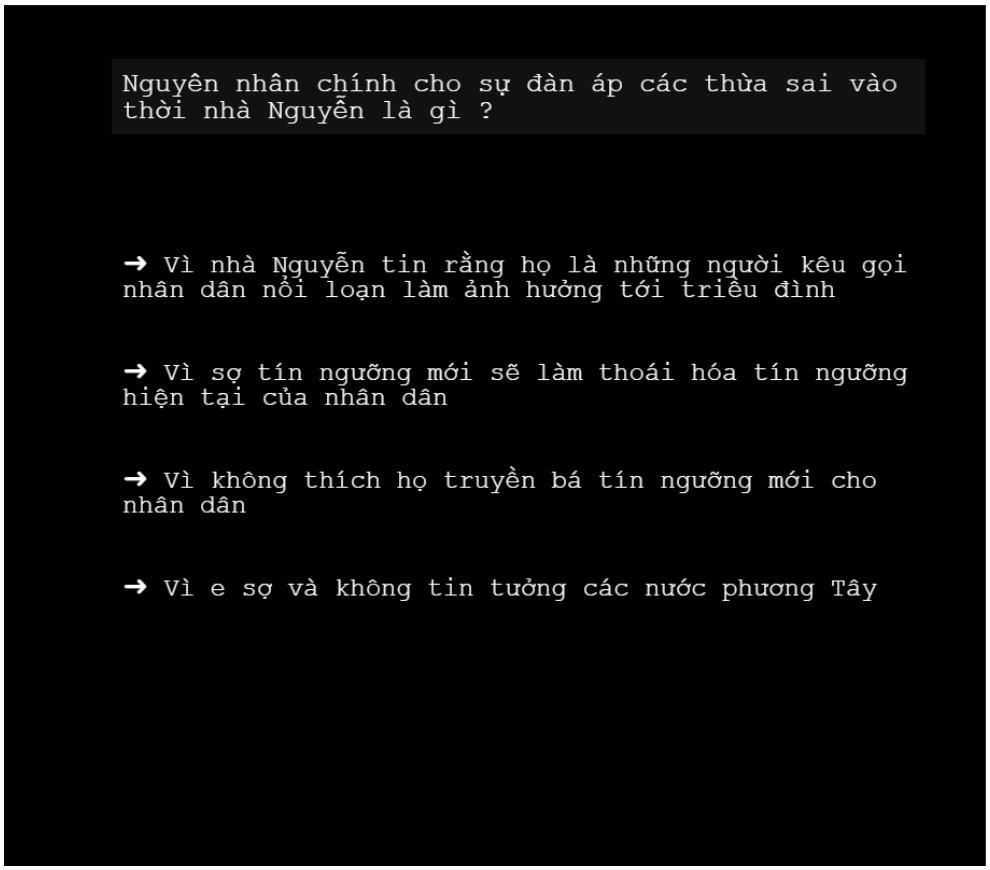

Figure 4.20: The quiz

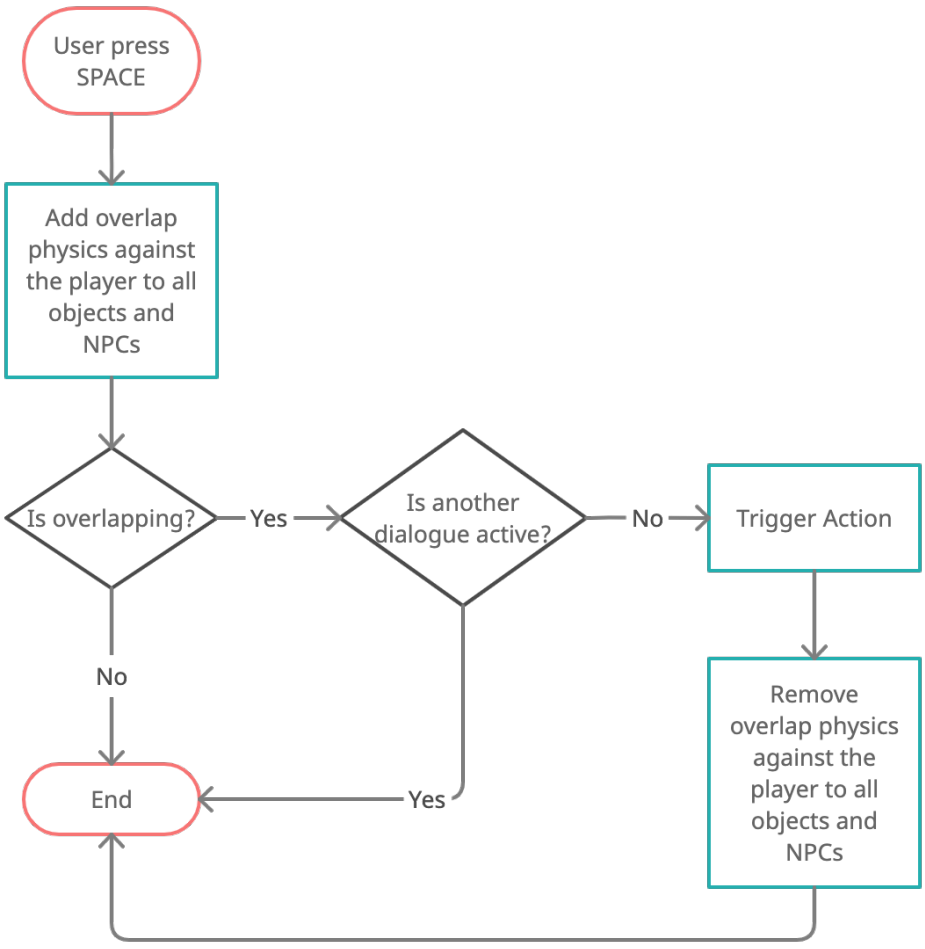

Figure 4.21: The flow of interaction system in the game prototype

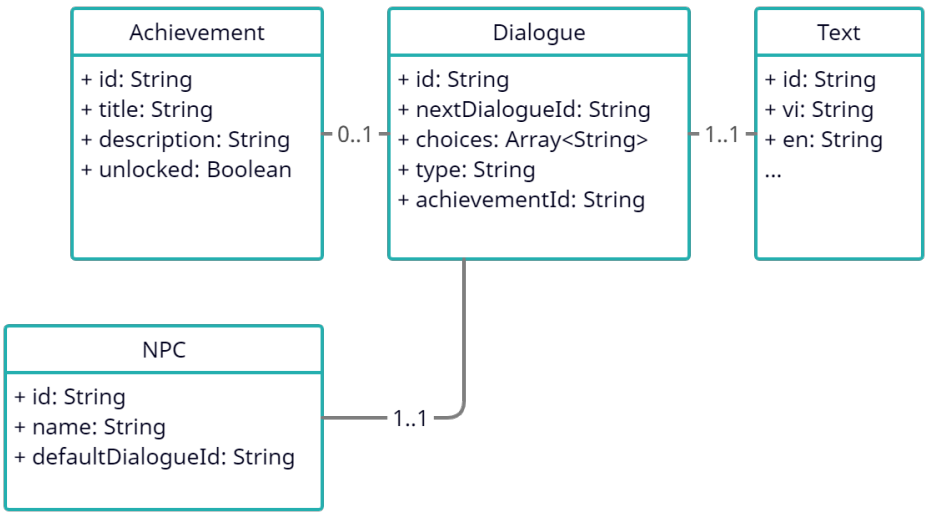

Figure 4.22: Dialogue system class diagram

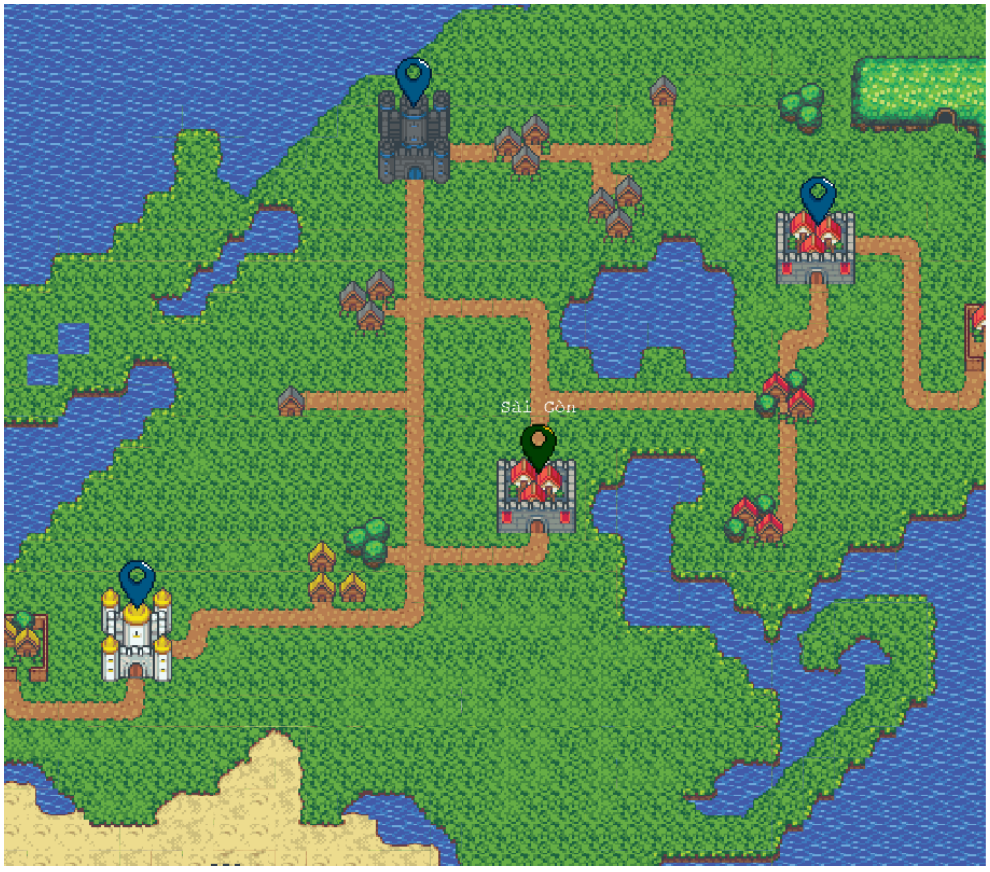

Figure 4.23: Map Scene shows available locations to advance the game

Figure 4.24: Journal with locked/unlocked historical information

Chapter 5

Results

5.1 Game prototype evaluation

Interviews were conducted with the domain experts to gather evaluation and feedback of the game prototype, including both teachers and students. Each interview lasted from 30 to 45 minutes. The interviews are semi-structured interviews, which take the form of a conversation where the interviewee can share whatever is on their mind regarding the prototype. The first version was presented to the teachers and students as a visualization from the discussion we had so that they have an idea of what the game could be, the feedback provided from the first version was used to develop the second version of the prototype which has better delivery and content. There are two separate sets of the question for the teachers and the students for each prototype version, listed below. The questions used in the interviews can be found in appendix B, note that these questions merely act as a skeleton for the interviews, more questions might have been asked based on the answer of the interviewee.

Expert Interview - First version

In the first version, both the teacher and the student representative found the role-playing and exploration factor of the game intriguing and were motivated to go through the game. They also like the simple graphics used in the game as they said it gives off a sense of simplicity and nostalgia at first glance, putting them in a comfortable position and eager to explore further, even for a person who does not play games. On the other hand, they found the way content of the game was introduced confusing because the dialogues used to connect the scenes were not informative enough. Additionally, they found the graphic distracts them from the actual dialogue in the introduction scenes in the sense that they were merely cutscenes [1]. They also mentioned the fact that the game seems to be lacking some

[1] "A cutscene or event scene (sometimes in-game cinematic or in-game movie) is a sequence in a video game that is not interactive, interrupting the gameplay. Such scenes are used to show conversations between characters, set the mood, reward the player, introduce newer models and

tutorials to introduce the player to the controls of the game.

Teacher review

Separately, from looking at the first version prototype, the teacher suggested two directions that they can use the game for. The first direction is to use the game in class as a discussion or lesson introduction support tool. In this direction, the game should only have 5-7 minutes of playtime due to the limit of 45 minutes for history class per week in the schools. In that sense, the game should aim to simplify the content as much as possible, only focusing on the key details of the lesson. The second direction proposed by the teacher is to replace the students' homework with the game, where instead of having to memorize pages of the textbook, they can play the game and do a small quiz on the lesson in the next class. The second direction allows the game to focus more on details and content since the playtime can be up to 45 minutes. However, with the second approach, great attention must be paid to the accuracy of history as it will be the main source for the students to learn from.

Student review

The student mentioned that the information they found during the game and the quiz at the end aligned with each other well, meaning they can use the information they have unlocked to answer the questions in the quiz without a problem. Additionally, the fact that information they unlocked during the game was not in the same order as the quiz questions so they had to think about it and connect the information when answering the quiz, which made them remember it longer. On the other hand, the student thought that the way of unlocking the information could be more challenging and that more interactive content could be added to make the game even more interesting. Furthermore, they suggested that there could be side quests or Easter-egg quests to unlock non-key but relevant information to the historical period to help enrich the lesson. They also thought it would be a good idea for the game system to highlight keywords to draw the player's attention to the key information and have an archive of dialogues where the player can access and review the information they learned throughout the game.

Expert Interview - Second version

Both the teacher and student agree that the game flow was significantly improved and the game content had a better alignment in this version by having a text-based introduction screen to introduce the background knowledge and the purpose of the game. They also found the tutorial scene extremely helpful. Even though the second version of the game does not contain as much graphics as the first version, they both found the way the game content this time was introduced in a cleaner

gameplay elements, show the effects of a player's actions, create emotional connections, improve pacing or foreshadow future events."[44]

way and they were able to comprehend the information much better. They were also more motivated to unfold the story of the game after the introductory text as they feel like they have a better sense of what to do in the game.

Teacher review

The teacher was happier with this version of the game. They thought the game could be used as introductory material for the lesson and were willing to move forward with a trial test in the classroom context in the next stage. However, they still mentioned that the character portraits and geographical arrangement of the tilemaps used in the game could be more precise in order to give the students a real feel of the world back in the 19^{th} century. Additionally, they had another direction that the game could take. The idea was to make the player's choice matter. For example, the player can convince emperor Napoleon III to not invade Vietnam, and reflect back on the reasons why he chose to do the thing he did in the past.

Student review

The student finished the game in around 7-10 minutes, which they feel like an appropriate time for the game to be part of the lesson. It was longer than the teacher expected. However, the student mentioned that since the game contains information in the lesson, it might be boring if they have to learn the information again after they have played the game if the teacher was to use it to introduce the lesson. The student finds it would be more useful at the end of the class as means to confirm the knowledge that they have learned throughout the lesson. He suggested that if the game was to be used before the lesson, it should contain relevant but not duplicated information that can later be linked into the lecture by the teacher. This way the students can establish the information link and thus understand the lesson better.

5.2 Answers to research goals

The literature study in section 2.2, as well as part of the design and implementation process of the prototype in chapter 3 and 4, covered the first research goal of this thesis which is to explore the common grounds between story-telling and serious game and the benefits of story-telling games in learning:

1. **What are the benefits of story-telling in learning?**
   First of all, story-telling can stimulate both sides of the brain which can help increase neuron activity in the brain thus improving the ability to form a connection between the past and present knowledge. The cohesive structure that holds a story together stimulates the right hemisphere of the brain which is responsible for creativity and intuition, while also containing information that can be picked up by the left hemisphere of the brain that is

responsible for pattern recognition. Additionally, a good story builds familiarity, trust and triggers emotions that allow the learner to feel like they were part of the story where they can relate and thus become more open to learning. Story-telling is also appealing to all types of learners. Visual learners appreciate the mental pictures storytelling evokes. Auditory learners focus on the words and the storyteller's voice. Kinesthetic learners remember the emotional connections and feelings from the story.

2. **What kind of benefits does story-telling games have compared to other story-telling media?**
   There is one major advantage that story-telling games have over other story-telling media is the ability to give the player first-hand experience to the story. Being in the game gives the player a sense of importance and responsibility as the game world revolves around them. This advantage combined with space-time manipulation, if done cleverly, can deliver a huge amount of complex knowledge to the player in a graspable way, allowing the player to remember facts longer and gain a multi-perspectival and multi-chronological view of the story.
3. **Under which form can story-telling games can appear and how can they attract learners?**
   There are many types of story-telling games, it could be a purely text-based game where the player gets to choose the direction of the events that take place in the game (eg. Choices of Robot) or an interactive novel with images and sound effects (eg. The Frankenstein's Wars) or even an open world exploration with intensive graphics, heavily invested soundtracks, voice-overs and loads of interactive features like quests, events, boss fights, etc. (eg. Genshin Impact).

The work done in chapter 3 and 4 answered the questions in the second and most important research goal, which aims to develop and evaluate a story-telling serious game based on a historical topic:

1. **How can the game incorporate historical knowledge into its content while maintaining engagement with the player?**
   By giving the player quests where they have to explore and unlock pieces of information that are not necessarily in order, the player is more motivated and intrigued about the information that they unfold in order to complete the quest and the story. Additionally, by introducing a storyline that the player can unfold as they progress through the quests helps the player make connection of the information they learned when they fill in the information from the quest to the missing part of story, just like solving a puzzle. Also, by adding interactive mechanics like movements and interaction with game objects that contain historical data, the player can learn about actual people and artifacts from history first-handedly. And last but not least, the way the narrative and graphic of the game is organized to deliver the story greatly affect the player's motivation and experience in the process of playing while

learning the historical content that was injected into the game.

2. **What features are useful in maintaining engagement and conveying the necessary knowledge to the player? Under which context can the game be part of the teaching curriculum?**
   According to the result of the interviews, despite the fact that there could be improvements on the game graphics to reflect real places and people in the historical period, the teacher agrees that the game can be used in a classroom context with guidance. They also give positive feedback about the practical experience that the game prototype can bring to the students compared to other historical media. Both the teacher and the student found the role-playing and exploration factor of the game intriguing and were motivated to go through the game. They also like the simple graphics used in the game as they said it gives off a sense of simplicity and nostalgia at first glance, putting them in a comfortable position and eager to explore further, even for a person who did not play games before.
   There are opposite opinions between the teacher and the student about whether the game can be used as an introduction for the lesson or as a way to practice what the students have learned after the lesson. This proves the need to have the game prototype tested in a classroom context to gain more information regarding the appropriate part of the lesson where the game can be placed in.
3. **In what ways can it be improved to be suitable in the teaching context?**
   The game graphic is one of the most important parts of the game that needs to be improved to accurately reflect the people and geographic locations of the historical period. Additionally, more interactive mechanisms, quests, achievements, and locations should be introduced to increase players' motivation and immersion in the game, which in turn should improve their learning experience. The game could also expand to a direction that allows the player's choice to determine the outcome of the game, use it to reflect back to the actual outcome in history, and learn the lesson from there.

Chapter 6

Discussion

6.1 Challenges

Despite having an idea of what the game is about when starting the thesis, the process of digging into the historical context and designing the game prototype from scratch are the biggest challenges. Not having enough information from the textbook, I find myself struggling a lot trying to understand the language of the resources I used to obtain information from as they were written in an old language form. Additionally, when I started digging, the information of this historical period became excessive and ended up related to multiple other events, which ended up taking a lot of time to extract and scope the information to something I can work with within the time limit of the thesis. With no background in game design as well as game development, the learning curve for the work done in this thesis was an extremely steep one for me. As the project has to be built from scratch, I had to do both game concept design as well as game graphic and narrative design before getting to the development work, and since I am a developer, I was unfamiliar with the design part of the game, for which I had to spend quite an amount of time to catch up. Using fairly new technology, Phaser, for this project was also a minor challenge as it is still adopting the new HTML5 game technologies into its system, resulting in a lack of features and functionalities that dragged out the development time of some core features.

Scheduling the interviews with the domain experts was challenging due to the timezone difference and their busy schedules. It took at least a week to find an appropriate time slot for me and the interviewee every time, which slowed down the prototyping cycle. Additionally, the domain experts are not familiar with English so the interviews had to be conducted using Vietnamese, and translated into English to be presented in the thesis.

6.2 Reflection

The game prototype's evaluation shows potential of being a practical support tool for teachers to convey the necessary knowledge in the lesson while maintaining engagement and motivation in students. Additionally, the student's feedback after playing the game shows that they were able to contextualize the lesson and form links between the information that they obtained through the course of the game by having a first-hand experience in history. This contributes to activating and developing process of historical consciousness as mentioned in chapter 2.

This project also has a positive effect on the history teachers. They revealed that being part of this project makes them feel more motivated at their job, knowing some people still care about history and try to find ways to make learning history more engaging and accessible.

Being designed from scratch and is based on actual educational content. This project offers an insight to the development process of a history education game, from start to finish. It would be a helpful reference especially for serious game developer as well as educational institutes who is interested in improving history learning experience through new and practical means.

Although not a super complex project, this project implemented some core functionalities in game development such as achievement, game object collision detection, interaction, characters' dialogue, and other exciting features. Besides fulfilling the main research goals, the game prototype is also a proof of concept for developers looking into the new HTML5 web game technologies. Since the project source code is available on Github and has a working version deployed in a public domain accessible through any browser, it is a good reference and starting point for people who want to start web game development.

Chapter 7

Conclusion

7.1 Conclusion

This thesis provides an insight into the benefits of using story-telling games in education, specifically in history education. As a proof of concept, a working prototype of a story-telling game was developed and went through two rounds of evaluation by the domain experts and is ready to be tested in the classroom. The game prototype is a 2D pixel RPG game where the player is a servant of Emperor Napoleon III in the 19^{th} century trying to look for information that allows the emperor to start the colonization of Vietnam. In the game, the player moves around in the game world, talking to different NPCs to unlock historical information and answer a quiz at the end of the game about the different reasons that are beneficial for emperor Napoleon III to move forward with his colonization plan.

The results from the evaluation interviews showed positive signs as the domain experts on both sides - teacher and student - enjoyed the practical aspect of the game prototype where they can explore and learn the information actively compared to the old method of learning passively through lectures and textbooks. The student also found it easier to make connections to the knowledge that they learned by being in the context and having to use the information they learned to complete the quiz at the end of the game. Despite many improvements that can be made to make the game more interesting and engaging for the students, the teacher suggested that the prototype be ready to be used in the classroom as an introduction to the lesson. The next step of this project would be to plan and execute the test session for the game prototype in the classroom.

The work done in this thesis can be used as research material for schools that are looking to try new technology and method to improve the teaching quality in history. It will also serve as a resource and reference for game/serious games developers and designers in Vietnam and other countries should they want to develop historical serious games.

7.2 Future works

As mentioned in the previous section, the next step for this project would be to plan and execute the test session in the classroom to gather formal feedback to help further improve the prototype. The game can also be extended to contain even more historical knowledge from the selected period. The current prototype only contains key information, however, it might be helpful for the student to know even non-key information that is relevant to the lesson. Besides that, many technical functionalities can be added and/or improved to help the students absorb the information faster and easier. Some of the features that are considered as major improvements for the game prototype would be, ordered by usefulness and feasibility:

- Improve the log and quest system to be able to contain more information as well as organize the information into categories that can be used by the students to review the knowledge that they have learned.
- Add keyword highlights to the characters' dialogues to help the student learn the information efficiently.
- Having portraits for the historical figures that are characters that are in the game to help the student have an impression of the actual historical figures.
- Use custom-made graphics in the game to reflect the real geographical location in that period of history and inject actual image to help the student visualize the past and make connection to the present.
- Add branching dialogues to create a non-linear story line that contains more fragments of the historical period, allowing the students to learn and relate more to the historical period and its events.

Postface

Working on a big project alone was a challenging but educational experience for me. Working alone gave me much freedom but at the same time much responsibility for the project. Having as much freedom as I was, I did not have enough time to implement everything I have planned to accomplish in this thesis, which is a disappointment. However, I managed to finish the parts I defined as the core features and am satisfied with the feedback I got from the experts after two rounds of review.

Getting to learn about and work with new areas such as game concepts and narrative design in this project was both exciting and challenging for me. I have always been interested in game concept design and would occasionally read about it but never got the chance to apply it in any of my work until this thesis. I find it difficult to apply the principles that I have read about to an actual project since it takes experience to maintain the balance of implementing different techniques and principles. The narrative design was extremely challenging for me because I have always been bad at using words. Having to design the characters' dialogues and storyline to be aligned with the historical content while maintaining the engagement in the tone was one of the most difficult tasks in this project, besides other non-programming tasks.

During this project, I discovered that I do not work well under pressure. In the first half of the thesis, my supervisor and I agreed on having weekly meetings update and discuss the project status. However, with a full-time job at hand, the work I had done weekly does not feel enough to involve my supervisor, and I feel bad every time that we had to cancel the meeting. Furthermore, the feeling of having to produce something to report to my supervisor weekly demotivated me to work on the thesis even though my supervisor comforted me and told me that it is okay to not have anything to report, which means I am doing good and does not need support from him, that the meetings are only there for me in case I have questions to ask him. Even so, I felt pressured to just see a meeting entry in my calendar.

Realizing that the fixed weekly meetings were affecting my productivity, I had a chat with my supervisor and we came to a new agreement that I will email him if I have questions or something to discuss. This new approach worked better as I started regaining my motivation and was able to focus on the thesis at my own pace. The downside of this was that I got too focused on the development work

and was slacking behind on writing the report, which is the most important part. This is when I learned that I am also not good at doing things in parallel. I prefer to have something in an acceptable state before moving to something else. In this case, I prefer to have the game prototype done and evaluated before focusing on writing the report about it. This way of working did not pan out well in the aspect of getting my supervisor feedback on the report because, by the time I got the evaluation completed, there was not much time left until the due date, and it would take time for my supervisor to review my work.

Besides technical challenges, COVID-19 was also preventing me from doing some of the work that I have planned for the thesis. Originally, this thesis was planned to be done in Vietnam where I have the transportation and the convenience of contacting teachers and students in both the planning and evaluating stages. The plan was to be able to have the game prototype, after going through the evaluation phase by the domain experts, tested in a classroom context for formal feedback from students. Unfortunately, COVID-19 restriction tightened once I started the thesis forcing me to stay in Norway. I tried my best with the situation and still managed to schedule some interviews with the teachers and students in Vietnam. However, due to the time difference and work/study schedule, it was difficult to contact and schedule meetings with people, therefore, I was not able to reach as many people as I had planned and also was not able to test the prototype in a classroom context either. Additionally, since I had to stay in Norway, I had to take a full-time job and work on the thesis part-time because of financial reasons. This affected my energy and attention on the thesis which in turn affected the quality of the work done in the thesis.

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Appendix A

Directive 5512: Develop and organize the implementation of the school's educational plan

On December 18th 2020, the Ministry of Education issued Directive No. 5512 on the organization of the school's educational plan. Accordingly, issued together with Directive 5512 are the appendices on the sample lesson plan according to Directive 5512, the frameworks for teachers' educational plan, the plan for organizing educational activities, the lesson plan, an example of evaluation form for lesson assessment, etc.

According to Mr. Nguyen Xuan Thanh - Director of Secondary Education Department, Ministry of Education and Training, the lesson plan framework in Appendix IV of Directive 5512 is not a sample lesson plan but suggested guidelines for teaching. The teacher identifies the goals and content of the lesson themselves.

BỘ GIÁO DỤC VÀ ĐÀO TẠO	CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM Độc lập - Tự do - Hạnh phúc
Số: /BGDĐT-GDTrH V/v xây dựng và tổ chức thực hiện kế hoạch giáo dục của nhà trường	*Hà Nội, ngày tháng 12 năm 2020*

Kính gửi: Các Sở Giáo dục và Đào tạo[1]

Thực hiện Thông tư số 32/2020/TT-BGDĐT ngày 15/9/2020 của Bộ trưởng Bộ Giáo dục và Đào tạo ban hành Điều lệ trường trung học cơ sở, trường trung học phổ thông và trường phổ thông có nhiều cấp học, Bộ Giáo dục và Đào tạo (GDĐT) hướng dẫn xây dựng và tổ chức thực hiện kế hoạch giáo dục của trường trung học cơ sở, trường trung học phổ thông và trường phổ thông có nhiều cấp học như sau:

I. Mục tiêu chung

1. Xây dựng và tổ chức thực hiện kế hoạch giáo dục của nhà trường bảo đảm yêu cầu thực hiện Chương trình giáo dục phổ thông cấp trung học cơ sở và cấp trung học phổ thông[2] (sau đây gọi là chương trình) linh hoạt, phù hợp với điều kiện cụ thể của địa phương và cơ sở giáo dục.

2. Phát huy tính chủ động, sáng tạo của tổ chuyên môn và giáo viên trong việc thực hiện chương trình; khai thác, sử dụng hiệu quả cơ sở vật chất, thiết bị dạy học đáp ứng yêu cầu thực hiện các phương pháp dạy học và kiểm tra, đánh giá theo yêu cầu phát triển phẩm chất, năng lực học sinh.

3. Nâng cao hiệu lực, hiệu quả quản trị hoạt động dạy học, giáo dục của nhà trường; bảo đảm tính dân chủ, thống nhất giữa các tổ chuyên môn và các tổ chức đoàn thể, phối hợp giữa nhà trường, cha mẹ học sinh và các cơ quan, tổ chức có liên quan tại địa phương trong việc tổ chức thực hiện kế hoạch giáo dục của nhà trường.

II. Xây dựng kế hoạch giáo dục của nhà trường

1. Kế hoạch thời gian thực hiện chương trình (phân phối chương trình)

Căn cứ vào kế hoạch thời gian năm học do Ủy ban nhân dân tỉnh, thành phố trực thuộc trung ương quyết định và hướng dẫn nhiệm vụ giáo dục trung học hằng năm của Sở GDĐT[3], Hiệu trưởng tổ chức xây dựng và ban hành kế hoạch thời gian thực hiện chương trình của từng môn học bắt buộc, môn học tự chọn, môn học lựa chọn, chuyên đề học tập lựa chọn, hoạt động giáo dục bắt buộc, nội dung giáo dục địa phương (sau đây gọi chung là môn học) bảo đảm tổng số tiết/năm học quy định trong chương trình. Chương trình mỗi môn học ở mỗi khối lớp được bố trí phù hợp trong cả năm học. Các nhà trường chủ động bố trí thời gian thực hiện chương trình bảo đảm tính khoa học, sư phạm, không gây áp lực đối với học sinh, không bắt buộc phải dạy môn học ở tất cả các tuần, không bắt buộc phải chia đều số tiết/tuần để sử dụng hiệu quả cơ sở vật chất và đội ngũ giáo viên, nhân viên của nhà trường. Đối

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[1] Sở Giáo dục, Khoa học và Công nghệ Bạc Liêu.

[2] Chương trình giáo dục phổ thông ban hành kèm theo Quyết định số 16/2006/QĐ-BGDĐT ngày 05/5/2006 và Chương trình giáo dục phổ thông ban hành kèm theo Thông tư số 32/2018/TT-BGDĐT ngày 26/12/2018.

[3] Căn cứ vào hướng dẫn nhiệm vụ giáo dục trung học hằng năm của Bộ Giáo dục và Đào tạo.

với mỗi mạch kiến thức trong các môn Khoa học tự nhiên, Lịch sử và Địa lí cấp trung học cơ sở có thể được bắt đầu thực hiện và hoàn thành trong từng học kì của năm học[4].

Đối với các môn học lựa chọn và chuyên đề học tập lựa chọn ở cấp trung học phổ thông, nhà trường xây dựng một số tổ hợp gồm 5 môn học được chọn từ 3 nhóm môn học lựa chọn trong chương trình[5] (mỗi nhóm chọn ít nhất 1 môn học) và xây dựng một số tổ hợp 3 cụm chuyên đề của 3 môn học trong chương trình phù hợp với khả năng tổ chức của nhà trường; đồng thời xây dựng phương án tổ chức cho học sinh đăng kí lựa chọn và tổ chức thực hiện để vừa đáp ứng nhu cầu của học sinh vừa bảo đảm phù hợp với điều kiện về đội ngũ giáo viên[6], cơ sở vật chất, thiết bị dạy học của nhà trường.

Đối với các hoạt động giáo dục được tổ chức theo hình thức tham quan, cắm trại, câu lạc bộ, hoạt động phục vụ cộng đồng (sau đây gọi chung là hoạt động giáo dục), Hiệu trưởng tổ chức xây dựng kế hoạch thời gian thực hiện phù hợp với kế hoạch thời gian thực hiện chương trình các môn học và điều kiện cụ thể của nhà trường; tạo môi trường cho học sinh được trải nghiệm, vận dụng các kiến thức, kĩ năng đã học trong chương trình các môn học, hoạt động giáo dục vào thực tiễn.

2. Kế hoạch giáo dục của tổ chuyên môn

Căn cứ vào kế hoạch thời gian thực hiện chương trình các môn học đã được Hiệu trưởng quyết định, các tổ chuyên môn xây dựng Kế hoạch giáo dục của tổ chuyên môn, bao gồm Kế hoạch dạy học các môn học (theo Khung kế hoạch dạy học môn học tại Phụ lục 1) và Kế hoạch tổ chức các hoạt động giáo dục (theo Khung kế hoạch tổ chức các hoạt động giáo dục tại Phụ lục 2). Đối với việc tổ chức các hoạt động giáo dục, đơn vị được giao chủ trì hoạt động nào xây dựng kế hoạch cụ thể để tổ chức hoạt động đó, bao gồm các thành phần cơ bản sau: mục đích, yêu cầu; nội dung, hình thức và chương trình tổ chức hoạt động; tiêu chí đánh giá kết quả hoạt động đối với các đối tượng tham gia; thời gian và địa điểm tổ chức; nguồn lực được huy động để tổ chức thực hiện.

Thực hiện sinh hoạt tổ/nhóm chuyên môn dựa trên nghiên cứu bài học; định kì sinh hoạt chuyên môn để xây dựng bài học minh hoạ, tổ chức dạy học và dự giờ để phân tích, rút kinh nghiệm giờ dạy dựa trên phân tích hoạt động học của học sinh[7]. Việc dự giờ, thăm lớp của giáo viên được thực hiện theo kế hoạch sinh hoạt chuyên môn của tổ/nhóm chuyên môn.

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[4] Đối với cấp trung học cơ sở, mỗi mạch nội dung của môn Khoa học tự nhiên có thể phân công cho một giáo viên có chuyên môn phù hợp (Hoá học: Chất và sự biến đổi chất; Sinh học: Vật sống; Vật lí: Năng lượng và sự biến đổi, Trái đất và bầu trời) để bắt đầu thực hiện và hoàn thành trong từng 1/2 học kì của năm học; mỗi mạch nội dung của môn Lịch sử và Địa lí có thể phân công cho một giáo viên Lịch sử và một giáo viên Địa lí để bắt đầu thực hiện và hoàn thành trong từng học kì của năm học.

[5] Nhóm môn học khoa học xã hội: Lịch sử, Địa lí, Giáo dục kinh tế và pháp luật; Nhóm môn khoa học tự nhiên: Vật lí, Hóa học, Sinh học; Nhóm môn công nghệ và nghệ thuật: Công nghệ, Tin học, Âm nhạc, Mĩ thuật.

[6] Bảo đảm định mức giờ dạy theo quy định của giáo viên trong nhà trường.

[7] Phân tích từng hoạt động theo 4 bước sau: (1) Mô tả hành động (đọc, nghe, viết, nói, làm) của học sinh trong hoạt động học (làm minh chứng để tiến hành bước 2 và bước 3); (2) Đánh giá kết quả hoạt động của học sinh (những gì học sinh đã học được, chưa học được); (3) Phân tích nguyên nhân những gì học sinh đã học được, chưa học được; (4) Đưa ra biện pháp khắc phục hạn chế, hoàn thiện kế hoạch dạy học.

3. Kế hoạch giáo dục của giáo viên và Kế hoạch bài dạy (giáo án)

Căn cứ vào Kế hoạch dạy học các môn học của tổ chuyên môn, giáo viên được phân công dạy học môn học ở các khối lớp xây dựng Kế hoạch giáo dục của giáo viên trong năm học (theo Khung kế hoạch giáo dục của giáo viên tại Phụ lục 3); trên cơ sở đó xây dựng các Kế hoạch bài dạy (theo Khung kế hoạch bài dạy tại Phụ lục 4) để tổ chức dạy học.

Không bắt buộc học sinh phải trang bị điện thoại di động để phục vụ học tập. Việc cho phép học sinh sử dụng điện thoại di động trong lớp học để hỗ trợ hoạt động học do giáo viên trực tiếp giảng dạy môn học quyết định; được giáo viên hướng dẫn cụ thể trong các hoạt động đã được thiết kế trong Kế hoạch bài dạy sao cho không yêu cầu tất cả học sinh phải có điện thoại để sử dụng và bảo đảm yêu cầu phù hợp với nội dung học tập. Giáo viên thông báo cụ thể yêu cầu học sinh chỉ được sử dụng điện thoại như là một thiết bị hỗ trợ hoạt động học và những điều học sinh không được làm khi sử dụng điện thoại trên lớp, trong giờ học.

Việc kiểm tra, đánh giá thường xuyên được thực hiện trong quá trình tổ chức các hoạt động học được thiết kế trong Kế hoạch bài dạy thông qua các hình thức: hỏi - đáp, viết, thực hành, thí nghiệm, thuyết trình, sản phẩm học tập. Đối với mỗi hình thức, khi đánh giá bằng điểm số phải thông báo trước cho học sinh về các tiêu chí đánh giá và định hướng cho học sinh tự học; chú trọng đánh giá bằng nhận xét quá trình và kết quả thực hiện của học sinh theo yêu cầu của câu hỏi, bài tập, bài thực hành, thí nghiệm, thuyết trình, sản phẩm học tập đã được nêu cụ thể trong Kế hoạch bài dạy.

4. Kế hoạch kiểm tra, đánh giá định kì

a) Đối với bài kiểm tra

Các tổ chuyên môn xây dựng ma trận, đặc tả đề kiểm tra, đánh giá định kì của các môn học ở từng khối lớp với ngân hàng câu hỏi tự luận và câu hỏi trắc nghiệm khách quan theo 4 mức độ yêu cầu như sau:

- Nhận biết: Các câu hỏi yêu cầu học sinh nhận ra, nhớ lại các thông tin đã được tiếp nhận trước đó hoặc mô tả đúng kiến thức, kĩ năng đã học theo các bài học hoặc chủ đề trong chương trình môn học.

- Thông hiểu: Các câu hỏi yêu cầu học sinh giải thích, diễn đạt được thông tin theo ý hiểu của cá nhân, so sánh, áp dụng trực tiếp kiến thức, kĩ năng đã học theo các bài học hoặc chủ đề trong chương trình môn học.

- Vận dụng: Các câu hỏi yêu cầu học sinh sử dụng kiến thức, kĩ năng đã học để giải quyết vấn đề đặt ra trong các tình huống gắn với nội dung đã được học ở các bài học hoặc chủ đề trong chương trình môn học.

- Vận dụng cao: Các câu hỏi yêu cầu học sinh vận dụng tổng hợp kiến thức, kĩ năng đã học để giải quyết vấn đề đặt ra trong các tình huống mới, các vấn đề thực tiễn phù hợp với mức độ cần đạt của chương trình môn học.

b) Đối với bài thực hành, dự án học tập

Các tổ chuyên môn xây dựng các bài kiểm tra thực hành, dự án học tập để kiểm tra, đánh giá định kì môn học ở từng khối lớp; các bài kiểm tra thực hành, dự án học tập phải nêu rõ các tiêu chí cụ thể để đánh giá phù hợp với yêu cầu cần đạt của chương trình môn học.

c) Tổng hợp nhận xét, đánh giá cuối học kì và cả năm học

Khuyến khích giáo viên hướng dẫn và giao cho học sinh viết tự nhận xét về ưu điểm, hạn chế, sự tiến bộ của bản thân trong học tập, rèn luyện đối với từng môn học cuối mỗi học kì; căn cứ vào kết quả đánh giá thường xuyên và định kì, giáo viên tổng hợp đưa ra nhận xét, đánh giá để học sinh hoàn thiện, chỉnh sửa và gửi cho cha mẹ học sinh.

Đối với các môn học đánh giá bằng nhận xét: Tổng hợp nhận xét cuối mỗi học kì và cả năm học được thông báo cho từng học sinh và ghi vào Học bạ học sinh.

III. Tổ chức thực hiện

1. Sở GDĐT chỉ đạo các Phòng GDĐT, các trường trung học phổ thông triển khai thực hiện đầy đủ, nghiêm túc hướng dẫn này; tăng cường công tác kiểm tra, thanh tra việc xây dựng và tổ chức thực hiện kế hoạch giáo dục nhà trường của các cơ sở giáo dục thuộc phạm vi quản lý; định kỳ hằng năm báo cáo tình hình và kết quả thực hiện về Bộ GDĐT.

2. Hiệu trưởng tổ chức xây dựng và ban hành Kế hoạch giáo dục của nhà trường, hằng năm báo cáo Sở GDĐT (đối với trường trung học phổ thông, trường phổ thông có nhiều cấp học có cấp học cao nhất là trung học phổ thông) và Phòng GDĐT (đối với trường trung học cơ sở và trường phổ thông có nhiều cấp học có cấp học cao nhất là trung học cơ sở) trước khi bắt đầu năm học mới.

Trong quá trình tổ chức thực hiện nếu có khó khăn, vướng mắc báo cáo về Bộ GDĐT (qua Vụ Giáo dục Trung học) để được hướng dẫn giải quyết./.

Nơi nhận:
- Như trên;
- Bộ trưởng (để báo cáo);
- Các Thứ trưởng (để phối hợp chỉ đạo);
- Cục Nhà trường;
- Các trường phổ thông trực thuộc;
- Các Cục, Vụ, Viện KHGDVN;
- Lưu: VT, Vụ GDTrH.

KT. BỘ TRƯỞNG
THỨ TRƯỞNG

Nguyễn Hữu Độ

Appendix B

Interview questions in the evaluation process

B.1 Interview questions - First prototype version

- Teacher questions
    1. What do you like/dislike about the game? (concept, interaction, quest system, dialogues, play time)
    2. If you were to use the game in your teaching, would you let the students play the game in the classroom or give it to them as a referencing tool, something they can play at home?
    3. Do you think this type of game would be able to communicate the reasons why Napoleon III decided to move forward with colonizing Vietnam well? If so, which functionalities do you think are crucial to communicate the topic?
    4. How do you think the game can be improved?
    5. Is there any extra functionality that you would like the game to have?
- Student questions
    1. What do you like/dislike about the game? (concept, interaction, quest system, dialogues, play time)
    2. Do you think you can learn more effectively by playing the game rather than learning the traditional way? If so, which characteristic of the game makes learning more attractive to you?
    3. If you were to play the game to learn the lesson, would you prefer to play it in the classroom or playing it at home? What is the expected playtime in each responding scenario?
    4. Do you think this type of game would be able to communicate the reasons why Napoleon III decided to move forward with colonizing Vietnam well? If so, which functionalities do you think are crucial to you for learning information about the topic?

5. How do you think the game can be improved?
6. Is there any extra functionality that you would like the game to have?

B.2 Interview questions - Second prototype version

- Teacher questions
  1. How do you feel about this version of the game compares to the previous one? (game flow, mechanics introduction, etc.)
  2. What are the things that you think are better in this version compared to the first one? Is there anything that is worse?
  3. How so you imagine using the game in the classroom?
  4. Is there any more feedback about the game in general that you want to give?
- Student questions
  1. How do you feel about this version of the game compares to the previous one? (game flow, mechanics introduction, etc.)
  2. What are the things that you think are better in this version compared to the first one? Is there anything that is worse?
  3. How long did it take you to finish the game? Do you think the play duration of the game is appropriate in a classroom context as an introduction to the lesson?
  4. If your teacher was to use the game as an introduction tool, leading to the lesson, do you think you would be more motivated to learn about the lesson compares to when there was no game?
  5. Is there any more feedback about the game in general that you want to give?

Appendix C

The links to the game prototype source code and playable version

Source code

Playable version

NTNU

Norwegian University of
Science and Technology