Legend of Hanzi – Uniting the Past and Present:

Interactive Video Game Enhance Chinese Hieroglyphics Learning

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Abstract

This research delineates the development of an interactive video game, which draws its conceptual inspiration from the Tower of Babel narrative in the Bible, aimed at exploring how digital technology enhances the learning of Chinese hieroglyphics and culture. The research question is how can physically interacting video games enhance language learning and what can contribute to language and cultural understanding. The study adopted a multifaceted design approach encompassing gamification, iterative development, playability assessment, and comprehensive user data analytics.

I tested my original interactive video game, *Legend of Hanzi* in the data collation. Evaluations of the game were conducted focusing on three primary aspects: the challenge level of the game, the intensity of its language instruction, and its pedagogical appeal. Feedback from these evaluations informed an analysis of the game's design strategies, particularly in the context of interactive language education. The research culminates in a synthesis of the findings, providing insightful conclusions and proposing theoretical hypotheses for future iterations and development of similar educational games.

Contents

1. Introduction

God says, 'Come, let Us go down and there confound their language, that they may not understand one another's speech.'

Genesis 11:7

1.1 Motivation

In the initial period, the entirety of the globe was united by a singular linguistic system and uniform mode of communication. However, subsequent to the epoch of the Tower of Babel, as the narrative is traditionally recounted in the Bible, linguistic forms have become dispersed across the entirety of the terrestrial sphere. To this day, the evolution of languages in the course of history has led to the extinction of some languages and significant transformations in others.

As elucidated by Marquet (2016), the essence of written language, since time immemorial and even in prehistoric eras, has been closely intertwined with technology and material culture. In the current digital age, we find ourselves immersed in a digital jungle, inundated with a plethora of visual information far surpassing that encountered by our forebears. This phenomenon is particularly evident in the routine use of social media for daily communication, where images and emojis are frequently employed to enhance and support expression. This comparison between ancient hieroglyphs and modern emoticons highlights a fascinating parallel: This reliance on visual elements in communication mirrors the ancient practice of using pictograms. The methods we use today to convey emotions and objects have a remarkable resemblance to those used in antiquity. This suggests an inherent inclination towards pictograms, a practice deeply rooted in human history.

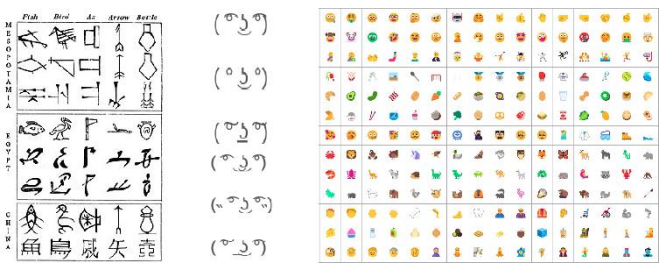

Figure 1.1 – 1.3: From left to right, cuneiform, Egyptian hieroglyphs, and Chinese characters. Kaomoji. Emoticon

Marquet (2016), referencing Meggs (2012, pp.78), describes that

"Hieroglyphics consisted of pictograms that depicted objects or beings. These were combined to designate actual ideas, phonograms denoting sounds, and determinatives identifying categories."

This ancient method of communication, primarily using symbols to represent objects and life forms, stands in contrast to the use of abstract terms in contemporary languages, especially for expressing emotions. This dichotomy leads me to infer a significant augmentation in the necessity for communication and emotional articulation throughout human evolution. Indeed, representing abstract emotions with physical symbols presents a challenge. However, it may be the case that the absence of specific ideograms for emotions in ancient scripts is due to a lack of emotional expression needs at the time. For instance, '鼎 (Ding)', a unique type of bronze vessel in China, as a physical object, has a corresponding character in Chinese oracle bone script, yet no evidence of this character exists in Egyptian hieroglyphs. There is not even a word for Ding in any other language. This is attributed to the non-existence of 'Ding' in other cultures, not to say the need for the expression of Ding. Additionally, Saussure's bifurcation theory of signs emphasizes that symbols can represent not only the material form of objects but also the concepts and meanings they convey. For instance, in the word "tree", the term "tree" serves as the signifier, while the concept of a specific tree that it represents acts as the signified. From this, we can deduce that the existence and forms of ideograms largely reflect the material and spiritual needs of a culture. Therefore, the differences in written characters across different eras are not merely linguistic variations but more profoundly reveal the characteristics and value systems of the times.

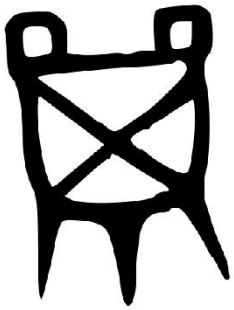

Figure 1.4 - 1.5: Pictures of 鼎(Ding) and oracle bones

Such observations raise critical questions about the role and function of language in human society. Does the evolution of language reflect a growing need for communication and emotional expression? How has this evolution affected the ways in which humans interact and engage in social exchanges? Considering this, I wonder if the integration of ancient pictograms with modern digital technology could enhance human communication and deepen emotional connections between individuals.

1.2 Research Goals

Using the story of Tower Babel as inspiration, my research question is how can physically interacting video games enhance language learning and what it can contribute to language and cultural understanding. Additionally, how can this project facilitate the exploration of ancient language types that particularly intrigue me, notably the oracle bone script and hieroglyphics of the Shang Dynasty, in terms of their potential educational feasibility under a gamified design. My goal is to construct a fully functional prototype, conduct a workshop with groups of participants to utilise this prototype, and subsequently carry out a focus group and questionnaire with these participants, with the aim of analysing their feedback for both the game project and the questionnaire. I then engage in an iterative process of updating my project based on the received feedback, subsequently advancing to a second round of audience testing and interviews, prior to conducting a more comprehensive analysis of the acquired data.

2. Background

2.1 Chinese as a Second Language Learning Context

Over the past two decades, the popularity of learning Chinese has experienced an exponential increase. The Hanyu Shuiping Kaoshi (HSK) examination represents a standardized metric for assessing Chinese language proficiency among non-native speakers (encompasses foreign students and individuals with Chinese heritage). The test is structured to offer certification across a spectrum of proficiency levels in the Chinese language, serving as a benchmark for linguistic competence in various academic and professional contexts (Chen, 2022). The information sourced from Chinese Testing International's website reveals that, as of the year 2021, the global landscape for Chinese language assessment encompassed 1208 testing centers. These centers were distributed across 155 countries or regions, catering to the linguistic development needs of approximately 30 million individuals engaged in the learning of the Chinese language (Chen, 2021). While the data provided by Practical Mandarin (2023) indicates a significant engagement in Chinese language proficiency assessments within Europe with over 2 million individuals annually participating in the HSK test. Furthermore, this trend extends globally, with the number of participants reaching approximately 5 million people worldwide.

2.2 Education Background

The swift progression of technology and the lockdowns and social distancing measures necessitated by the COVID-19 pandemic has significantly impacted all aspects of life, notably education. This led to a paradigm shift in the methods educators employ to provide quality education through various online platforms. The teaching and learning methodologies and approaches are also evolving to address the new and upcoming educational needs and requirements (Romero, 2014). This development has spurred the growth of educational technology as a multidisciplinary domain. The incorporation of technological applications into the educational process has undoubtedly influenced the teaching process, environment, approaches, and methodologies (Becker et al., 2017). Online learning, distance, and continuing education have become vital solutions in addressing this unparalleled global pandemic.

Viewed from multiple angles, educators, schools, institutions, and governments are confronted with considerable challenges in the realm of online education. During the COVID-19 pandemic, based on a survey conducted by Pokhrel and his colleagues (2021), students have transitioned to homeschooling, yet the suitability of domestic environments across diverse educational standards and socio-economic strata remains markedly heterogeneous. For example, students with special needs and learning disabilities, such as auditory, visual, and mobility impairments, or those with inadequate internet connections or no access to electronic devices at home, necessitate additional training with appropriate support and guidance (Pokhrel, 2021). Many caregivers and parents are unable to fulfill these requirements, hindering the educational advancement of these students. Nonetheless, the COVID-19 pandemic has undeniably presented opportunities for remote programs that were previously unprepared and

unimplemented for e-learning systems, significantly hastening the fusion of technology and education.

2.3 Technical Context

In contemporary times, students are often characterized as "digital natives," owing to their upbringing in an environment deeply permeated by digital technology. This background confers upon them a notable proficiency in the daily manipulation of digital devices and media (Prensky, M.2001). Furthermore, the ubiquity and instantaneous nature of information access, irrespective of location or time, have markedly transformed the modalities through which students acquire knowledge and stay informed (Chang, C.Y. et al, 2018).

Therefore, to provide high-quality education and meet students' needs, technology-enhanced learning should be adopted (Lampropoulos, G et al, 2022). Using game based learning and gamification in the educational process can contribute toward improving the educational process (Zhang and Nouri, 2018). Due to its interactive and engaging nature, the game based learning (materialized through tablets) mainly focuses on Math (8 studies), Natural Science (10 studies) and Language study (11 studies), while yielding educational benefits and creating new learning opportunities and potentials. Gamification positively affects the educational process as it helps integrate game mechanisms and elements into teaching and learning activities, which in turn provide students with more intriguing, motivating, and engaging experiences that have the potential to increase their academic performance (Nah et al., 2014; Majuri, Koivisto and Hamari, 2018).

2.4 Related Work

2.4.1 Mobile Platform Applications

The trend of gamification is gaining popularity in several areas involving learning. Recently, some of the resulting concepts have been applied to language learning and there have been many commercial success stories.

- **Chineasy**

This app endeavors to facilitate the reading of Chinese characters for beginners by identifying characters through straightforward illustrations. It advocates for my project's increased utilization of pictograms over contemporary Simplified Chinese, as pictograms, being more image-based, are more accessible and comprehensible. Simultaneously, this approach effectively demonstrates the evolution of Chinese script from ancient times to the present, serving a role in the promotion of cultural heritage.

Figure 2.1: Chinesay

- **GraphoGame**

Spelling games are extensively utilized in the development of literacy skills. This is corroborated by the research conducted by Walubita and colleagues in 2015, whose study involved the implementation of 'GraphoGame' on the tablets of students, which is an evidence-based computer game particularly designed to assist young learners in establishing a foundational understanding of the relationship between letters and phonetics. This understanding is crucial for the acquisition of reading skills.

The study determined that the primary focus of learners shifted from educational objectives to progressing through game levels, with victory in the game becoming their main motivation. Concurrently, the game served as a non-intrusive evaluation instrument, perpetually gathering data and autonomously monitoring progress during gameplay.

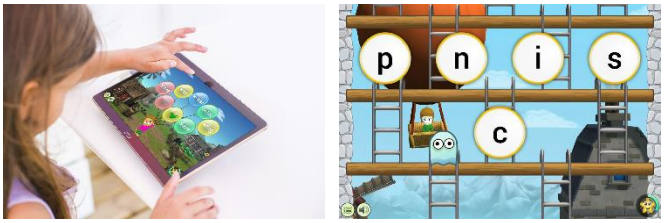

Figure 2.2: GraphoGame

2.4.2 Video Games

- **Heaven's Vault**

In *Heaven's Vault*, the player takes the role of an archaeologist called *Aliya Elasra*. The player's goal is to uncover the secrets of this enigmatic region, especially the lost history of a vanished civilization known as the *Iox*. To do this, players must decipher an ancient hieroglyphic language called "Ancient" and piece together the history of the Nebula and its inhabitants. The gameplay involves deciphering the Ancient language by translating inscriptions, texts, and conversations. As player progress, they will improve their language skills and gain insights into the *Nebula*'s history. While "*Heaven's Vault*" features a constructed language, it is conceivable that real-world languages could be employed as challenging content within such games. In his recent paper, Marcin Opacki (2022) posits the hypothesis that the utilization of a real-world language, as

opposed to a constructed language (commonly referred to as "conlang"), could potentially enhance player engagement through increased exposure to and manipulation of linguistic input. Furthermore, such an approach might facilitate a certain level of grammatical development among players. This proposition stems from the notion that language-related puzzles recurrently embedded within the game's narrative would, in a manner of speaking, elucidate the grammatical aspects of the language under consideration. Consequently, this could direct the player's focus towards grammatical nuances that might otherwise have escaped their attention. However, Marcin does not substantiate this claim in his paper. I intend to explore the incorporation of real-world languages, (Chinese hieroglyphics), into video games as part of my project. This endeavor aims to enhance narrative complexity and promote cultural awareness within the gaming context.

Figure 2.3 – Heaven's Vault game screenshot. In the game context, the emperor thinks he can represent god, that's why the word 'emperor' and 'holy' looks so similar.

- **Chants of Sennaar**

Similar to Heaven's Vault, in Chants of Sennaar players are engaged in the translation of fictional languages through puzzles and mini-games. Chants of Sennaar tasks players with deciphering a sequence of glyph-based languages using logic and context clues. For instance, an inscription adorning a commercial establishment might provide the lexicon for "potions," while ecclesiastical frescoes could unveil a tribe's denomination for the divine. As the narrative progresses, the player is tasked with the decryption of five distinct languages, each representative of a separate group. Notably, one of the creators, Moya, acknowledged the similarities in the mechanism of language deciphering between their game and Heaven's Vault, an inspiration that catalyzed the project's inception post his experience with the latter (Jason, 2023). Within the game, players are immersed in the linguistic diversity and cultural heritage of the universe through interactions with NPCs from different castes, each possessing unique logographic writing systems. Each language in the game has been meticulously crafted with distinct syntax and vocabulary, reflecting the deep cultural backgrounds of the civilizations within the game. These languages are not merely aesthetic additions but are pivotal to solving puzzles and progressing the game's narrative. This exploration of language underlines the game's commitment to illustrating the intrinsic link between language and culture and how language shapes our perception of the world.

Figure 2.4: Chants of Sennaar – Rundisc

Most apps focus solely on teaching language use, neglecting the cultural essence that languages inherently represent. However, in reality, each language is intimately connected with its corresponding culture. Video games offer broader opportunities to showcase an entire cultural context through multimedia elements—images, sounds, artifacts, scenarios, dialogues—rather than just language. Nevertheless, the video games exemplified here employ fictional languages (conlangs) and cultures. These cases are by no means an exhaustive review of gamified learning and practical applications in gaming. On the contrary, these projects serve as an excellent blueprint for the integration of technological research with education, reflecting the potential of language-based digital technologies. I intend to adopt a similar approach in my research on game-level design.

3. Methodology

In the methodology section of this research, a multifaceted approach is employed to explore the integration of modern electronic technologies, with a specific focus on interactive electronic games, in the teaching of the Chinese hieroglyphics.

3.1 Iterative Design and Prototype

Central to this study is the concept of iteration, which entails a process of iterative design and model development. This approach is instrumental in creating engaging and effective game interfaces and game mechanics.

3.2 Multimodal Learning and Educational Game

Alongside, multimodal learning and educational game are emphasized, acknowledging the importance of integrating various sensory modalities to enhance the educational experience through video games.

3.3 Embodiment

Lastly, the notion of 'Embodiment', particularly through avatar identity, is explored. This aspect examines how the digital representation of learners in a virtual environment can influence their linguistic acquisition and cognitive processes.

Collectively, these elements form the core of the proposed methodology, aiming to advance players' understanding of language and culture through innovative interactive electronic video games.

4. Iterative Design Process and Project Write-Up

4.1. Iterative Design Process and Evaluation

The inspiration for Legend of Hanzi is derived from the story of the Tower of Babel from the Bible. I aimed to develop an interactive electronic game centered around language. Based on the research design methodology of Zimmerman (2003), I will elucidate in detail the iterative process of my project in the following text.

4.1.1. The Black Box Challenge

Initially, for the rapid development of a playable interactive model, I and my team designed a game purely in a physical environment. The rules of the game are as follows:

- This game needs four players and is separated into four parts by its rule. The first player touches the object in a dark box with eyes closed or covered, guesses and describes by human language but does not directly say the name.
- The second player draws from the description and then shows it to the third player in silence.
- The third player guesses based on the content of the picture and describes it to the fourth player in body language in silence.
- The last player guesses the item in the box by body movements.

In contrast to the traditional concept of written language, in this project, we are more inclined to explore a variety of different non-verbal communication methods. The test results demonstrated the variations in thought processes across different backgrounds and contexts.

Figure 4.1 The Black Box Challenge test filming- The fourth player easily guessed 'mug', but failed to guess 'Arduino DFPlayer Mini sensor'. This is attributable to the ubiquitous nature of everyday objects like mugs, in contrast to the more specialized and less commonly encountered items like the Arduino DFPlayer Mini sensor. This suggests that simplifications and misunderstandings can affect the effectiveness of non-verbal communication, especially in different contexts and backgrounds.

4.1.2 The Tower Babel

To further develop and refine our project while exploring the creative integration of digital technology with the physical environment, I and my team decided to transition the Black Box Challenge to a video game.

The second iteration is a physical combined video game. It was still based on the tower babel story but focused more on the tower building. Based on the rule, four players have to work together to build a tower as tall as they can. There is a panel on the bottom of the screen as ground, the brick would randomly appear on top of the screen. Three players need to stand separately back to the screen to control three sensors, separately for left right, and up. The other player stands in front of the screen as a conductor, giving orders to the other three players and hitting the confirm button.

Owing to the project's objective of being showcased in an exhibition, I aspire for all attendees - not solely the participating gamers, but also those passersby who are drawn in - to relish the game and garner a delightful gaming experience. Consequently, I have retained the mechanics of non-verbal communication in the gameplay to encourage broader participation in this project. The experimental outcomes corroborate my design approach: all spectators found enjoyment, and even those too shy to join left with broad smiles on their faces.

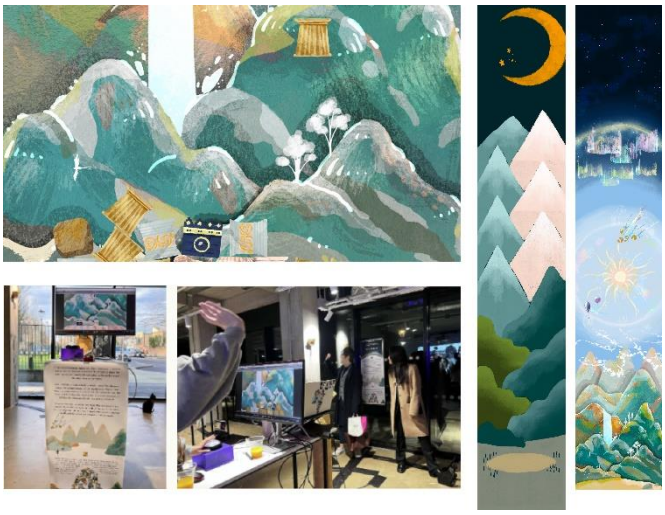

Figure 4.2: Tower Babel screenshot and exhibition filming - Nearly all players agree that the aspect of orchestrating cooperation poses a significant test in the game. Furthermore, a part of these players believe that although the game underscores the theme of the Tower of Babel through the construction of high towers, it is challenging to experience the linguistic diversity inherent in the story of the Tower of Babel through non-verbal communication within the game.

4.1.3 Legend of Hanzi --- Uniting the Past and Present 1.0

In line with the conceptual framework inspired by the Tower of Babel, my team and I have elected to concentrate our efforts on the challenge of breaking down language barriers. Based on the preceding discourse on logograms and hieroglyphics, coupled with the recent surge in learners of the Chinese language, we aimed to explore the potential of Chinese hieroglyphics as a means to transcend linguistic obstacles.

Within the game, players are required to employ a bow and arrow to accurately target and select the corresponding pictographic characters, as guided by the English instructions displayed at the top of the game interface. In the next level, participants will observe an animation depicting the evolution of these characters from ancient to modern times and are tasked with striking the bullseye using a dart.

Figure 4.3 Legend of Hanzi game scenes screenshot and project test filming - All participants expressed surprise and curiosity regarding our utilization of bows, arrows, and darts as sensors. Concurrently, a subset of those involved in the testing expressed a desire for an expanded variety of levels. Additionally, although no participants explicitly mentioned it during interviews, the necessity for players to remain seated throughout the gaming experience, in my view as a creator, is a shame and suggests that our unpolished project installation does not do justice to the intricately designed gameplay.

4.1.4 Legend of Hanzi --- Uniting the Past and Present 2.1 & 2.2

In pursuit of advancing this project, I conducted a comprehensive analysis of the feedback received from the testing of the previous iteration model. Subsequently, this analysis informed the development of corresponding optimization strategies for the design.

Initially, I incorporated an additional level to extend the gameplay duration for players. In this new level, players are required to verbally issue commands to control the movement of their game character, thereby facilitating oral practice within the game context. The level design adopts a retro horizontal-move format, predicated on the belief that even in the absence of explicit gameplay instructions, the familiarity of this classic gaming style enables players to quickly comprehend and react to the required actions.

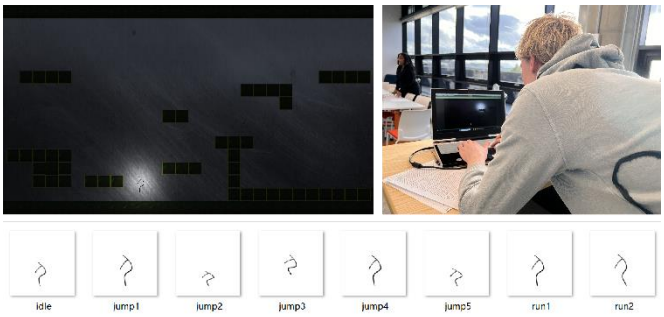

Figure 4.4: Legend of Hanzi game new level scene screenshot, test filming, and animation assets

I had the opportunity to host a workshop after completing the design of the new level in which I invited participants to test my project. The participants expressed that their understanding of and interest in learning Chinese greatly increased through the project presentation and experience. Meanwhile, I received invaluable feedback and analysis as below:

- Due to the overall dark environment of my level design, illuminated only by point light sources carried by the game characters, players suggested enhancing the level design by improving lighting effects and adding 3D depth effects to augment visual appeal. In response, I investigated Hollow Knight and Super Meat Boy as references (Team Cherry, 2017 and Team Meat, 2010).

Figure 4.5: Hollow Knight (left) and Super Meat Boy (right) video game

- Furthermore, in the absence of any enemies or collaborators, players found it challenging to identify goals or motivations within this level. Perhaps adopting an 'endless chasing game' format could enhance player engagement.
- Additionally, to increase the game's narrative aspect, integrating brief dialogues in Chinese could be considered. Employing puns in the dialogues could introduce ambiguity and equivocation, where player choices may lead the narrative in different directions.

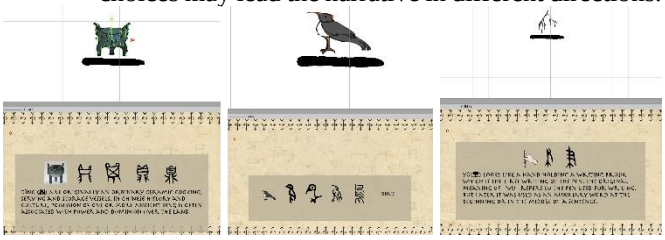

Figure 4.6: Dialogues in New Level

In response to player feedback, I modified the level to a vertical endless platform game and incorporated hand-drawn, interactive game props. These props enable players to trigger dialogues, thereby enhancing their understanding of Chinese hieroglyphics and culture. In the following section, I will elaborate in detail on the use and design of elements within the game.

4.2 Elements and Intelligibility

> *Rock, clay, cradle, papyrus, parchment, brush, paper, tint, print, appear in a long list of materials that have been recording human life.*
>
> *Marquet, 2016*

4.2.1 Bow and Darts

In my view, objects and tools that epitomize an era are an excellent means of showcasing cultural aspects of that time. This method can also be employed in video games to enhance player embodiment, thereby enriching the narrative and immersive experience of the gameplay.

- The bow and arrow, a rare long-range weapon among ancient cold weapons, is believed to have been invented by the ancestors of the Zhang family, hence the bestowal of the Zhang surname. In antiquity, the bow and arrow were considered a highly dangerous ranged weapon.
- The dart, small in size and easy to operate with a long range and strong concealment, features extremely sharp spikes and is particularly lethal due to the practice of coating it with poison.
- The spear was the preferred weapon of ancient infantry, typically wielded alongside a shield. Measuring around five meters in length, the spear's red tassel was used to distract and confuse the enemy.

In contemporary society, these tools no longer serve their original military and martial arts functions but are more often seen as decorative items or used in sports. In this project, players have the opportunity to interact using bows and darts equipped with sensors. The amalgamation of modern digital technology with tools from bygone eras not only allows players to experience the charm of historical cultures but also enhances their sense of being embodied in the game world as if they are a part of it.

Figure 4.7: Players using bow and darts

4.2.2 Shang Dynasty

- **Oracle bone script**

The pivotal core of this game, oracle bone script, although initially originating from the early Neolithic period (circa 6600-6200 BCE), saw the Shang dynasty play an instrumental role in the evolution and standardization of oracle bone script and pictographs into a more structured form of writing (Kris, H., 2018). Therefore, I have centered my investigation on the Shang Dynasty, deciding to incorporate more elements related to the Shang culture in the project.

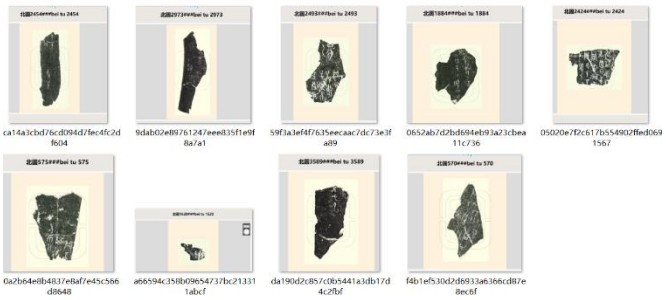

Figure 4.8: Topography of oracle bones

- **Celestial movements (Sun and Moon phases)**

The religious ceremonies of the Shang period were characterized by divination and sacrificial rituals. The Shang people calculated the dates for these religious activities and divinations by observing celestial phenomena (David, 2015). Moreover, the oracle bones also reflect the Shang Dynasty's records of astronomical events and the use of the sexagenary cycle for timekeeping. Evidently, the Sun and the Moon held significant importance in the Shang civilization.

Figure 4.9: Moon Phase Portrait (Riding T.W.A.W., 2021)

- **Bronze ware**

The advancements in bronze casting and pottery during the Shang Dynasty marked one of the most important and iconic artifacts of this era (Zhang, C. and Childs-J. E, 2018). These bronze wares, predominantly ritual vessels, were used in sacrificial ceremonies and religious rituals, with the Ding being particularly renowned. The Shang Dynasty's bronzes were often adorned with intricate patterns, most famously the Taotie motif. This motif, embodying mystery and a sense of power, typically depicts a fierce, enigmatic creature with distinctive facial features. This pattern, widely found in Shang Dynasty bronzes, continued to be inherited and evolved in subsequent dynasties.

Figure 4.10: Ding and Taotie motif (Heyi, 2020)

- **The Black Bird**

According to mythological accounts, the people of the Shang Dynasty believed themselves to be descendants of the Black Bird (Loewe, M. et al., 1999). Thus, I have sourced artefacts featuring the Black Bird motif for reference.

Figure 4.11: Sun Bird Gold Foil (Li, 2015)

- **Final Design**

Figure 4.12: Level 1-3 game background - With the assistance of my artist friend, I successfully integrated the Shang Dynasty elements mentioned in this section to create the final background image for my project.

4.2.3 Hieroglyphics Styling

- **3D Rendering of Hieroglyphics**

In the film 'Arrival', the extraterrestrial language manifests as a complex, three-dimensional ring-like form known as Heptapod B. This symbolic language conveys meaning through its symbols, employing spatial visual distortions to represent variations in noun endings, including changes in stroke curvature, thickness, and undulation, as well as alterations in relative positioning. In reality, ancient pictographs were presented through seal carvings, also possessing 3D textured reliefs. However, contemporary studies have evolved these from their original stone tablet, stone wall, or tortoise shell mediums into the flat scripts we see today. The transition from three-dimensional to two-dimensional representation inevitably results in significant loss of information. While I have not extensively researched this area, I aspire to expand the audience's and players' imagination regarding the form of presentation of scripts through this approach of rendering texts in a three-dimensional format.

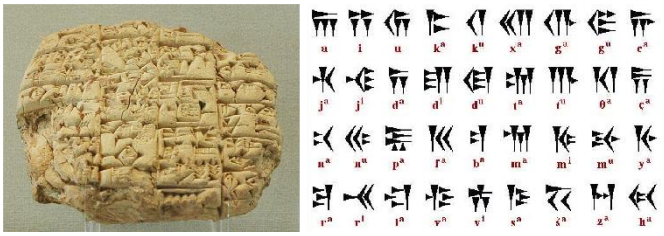

Figure 4.13 Left: Early Dynasty Sumerian cuneiform tablet, Louvre Collection (AO4238). Right: Chart of Flattened Cuneiform Script Alphabets Post-Imprinting

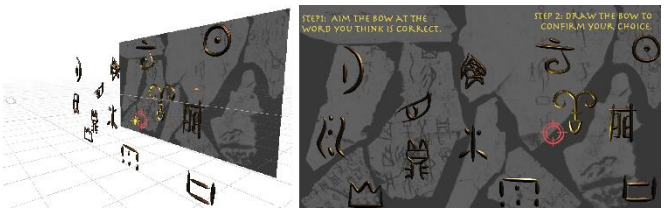

Figure 4.14: 3D word models in Level 1 and metallic material rendered by point light - In order to visually align with other levels, I applied a metallic texture akin to that of bronze on the 3D text and rendered it using a warm yellow spotlight.

4.2.4 Chinese Hieroglyphics and Calligraphy in Game Art Assets

Owing to the hieroglyphics nature of Chinese characters, which bear a closer resemblance to a symbolic language, I conceived the idea of incorporating these characters directly into the game, using them within the user interface and game prop materials. This approach allows players to intuitively grasp the meaning associated with each character. For instance, I employed the character '束' (cì), correlating to 'spike', and '矛' (máo), representing 'Spears' in Chinese, as elements to determine player fatalities within the game levels. In the design of the game characters, I have directly employed the pictographic character '人' (rén), meaning 'person', and have suitably modified its form to meet the requirements of the game's animation.

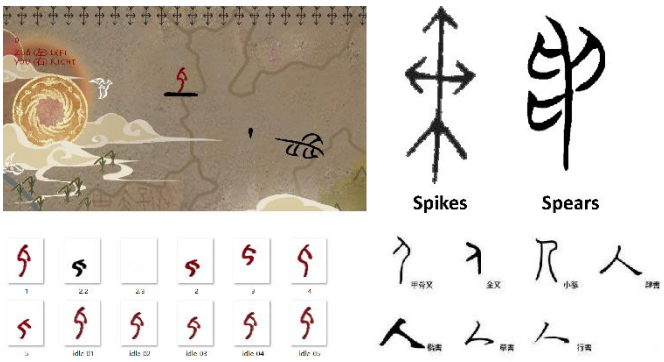

Figure 4.15: Game assets and Chinese hieroglyphics

Furthermore, due to the intimate connection between Chinese calligraphy and the Chinese language, I have integrated elements of Chinese soft brush calligraphy into the level design. Among the myriad of fonts, Clerical Script is often the primary choice for beginners of soft brush calligraphy. Based on their shapes, I have adapted three strokes from Clerical Script as three platforms with distinct physical properties in the third level. As illustrated below, these

platforms are the basic platform, the rotating platform, and the elastic platform.

Figure 4.16: The application of calligraphy strokes in Level 3

4.3 Sound Effects and UI Design

In the initial iterations of the game's testing, I observed that most players, including those accustomed to video games, struggled to understand the gameplay at first. Consequently, I added textual prompts to each level. Particularly in the third level, I introduced audio cues for every Chinese character appearing in the game. This enhancement not only augments the game's playability but also encourages beginners of the Chinese language to familiarize themselves with its pronunciation through auditory practice.

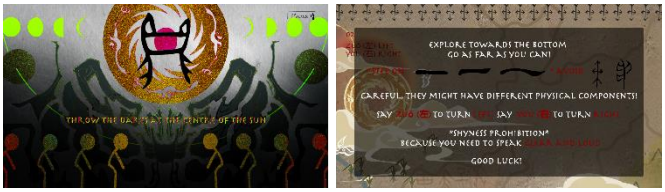

Figure 4.16: Text induction in Level 2 and Level 3.

Game music plays a crucial role in enhancing the immersive experience of the game. In the first and third levels, I have utilized music that is comparatively soothing and relaxed in tempo. Conversely, for the game's commencement, conclusion, and second level, I have selected rhythmically intense pieces of traditional Chinese-style pop music. This choice is deliberate, as these levels do not feature voice prompts, ensuring that the potent rhythm does not interfere with the players' judgment in the game.

5. Evaluation Results and Future Work

5.1 User Experience analyzation

During the development of the project, my time spent in university and community settings enabled frequent interactions with peers, mentors, as well as the educational and technical teams at the school. This facilitated the acquisition of extensive feedback through numerous informal tests and interviews. Although only seven volunteers participated in the final test by completing a questionnaire, the actual number of participants significantly exceeded this figure. Moreover, due to the constraints of the work environment, the majority of the survey participants were professionals in computational arts or related digital technology fields. Additionally, each player's prior gaming experience, game preferences, linguistic background, and receptivity to new cultures varied, leading to biases and differences in gaming perception and behavior. I will delve into these unforeseen issues related to audience background in the following sections, integrating data collected from the survey with results from informal interviews.

5.1.1 Intelligibility and Narrative

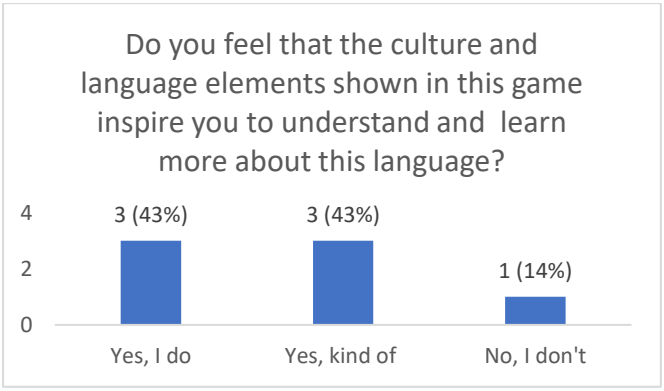

Chart 1: User research results (1)

When queried about the game elements related to language and culture, three players expressed a positive attitude towards elements such as oracle bone inscriptions, bronzeware, and Chinese calligraphy strokes. These elements not only facilitated their understanding of Chinese hieroglyphics but also sparked a deeper interest in exploring Chinese culture. They expressed a desire for more in-depth background stories within the game. For instance, the character in the third level, inspired by the pictograph of "人" (human), led players to speculate about an underlying story, which, however, was not explained in the game. Another three players believed that these elements aided in language comprehension to some extent but did not evoke a desire to delve deeper into the culture. One player admired the interface design of the game, especially the 3D metal textures and lighting effects in the first level, but regretted that these elements only enhanced the visual experience without contributing to an understanding of language and culture.

Additionally, despite the diversity in national and cultural backgrounds of the project participants, there was a unanimous interest in the narrative aspects of the game. In the in-depth discussions following the testing phase, participants were captivated by the history and evolution of Chinese pictographs, as introduced by me. Owing to its

combination of engaging content and academic accuracy, there was a collective desire to experience more historical narratives within the game.

Based on the feedback, I believe it is necessary to incorporate more visual texts to enhance the connection between the game's content and its levels. In the previous iteration, I introduced some object hieroglyphs into the game based on feedback. Considering the whole duration of gameplay, I believe that brief stories can engage players without overwhelming them with lengthy readings. Since the origin of language in Western culture goes back to the Bible, I also wanted to study the ancient Chinese hieroglyphics related in Chinese mythology. Next, I plan to create a complete script based on Chinese mythology with language as core , incorporating dialogues and puzzle-solving elements.

5.1.2 Embodiment and Mechanics

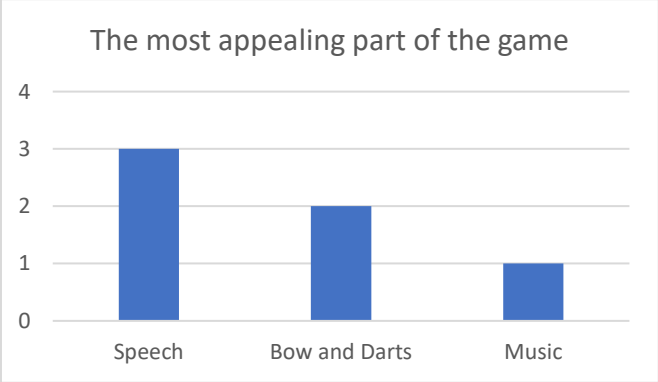

Chart 2: User research results (2)

The survey results indicated that all players were deeply engaged with the diverse interactive methods utilized in this project, with the archery aiming mechanism employed in the levels receiving remarkable acclaim. Additionally, the majority of players found the voice recognition control in the third level intriguing, significantly boosting their participation and evoking a 'party game' ambiance. Interviews revealed an increased focus on the game's music compared to the previous iteration, likely because the design now integrated music as a fundamental aspect of the level design, rather than merely as an embellishment. Furthermore, given the voice recognition game mechanics, players expressed interest in future versions incorporating interactive projections or motion capture for character movement control. There were also suggestions for adding more levels, showcasing Chinese culture from various perspectives.

What's more, in the third level's testing phase, I observed a potential issue that, although not mentioned by players in surveys and interviews, suggested the level design might be excessively challenging. The game mechanic I devised involves randomly generated platforms that ascend continuously. Players issue voice commands to control the character's movements, jumping between platforms. Upon hitting the ceiling (top line), the character dies, triggering a "Game Over" menu, offering the option to either 'quit' or 'restart' the game. I noted that all players quickly reached the ceiling and chose to restart, with most willing to try more than three times, but none exceeded five attempts. The random nature of the platforms was intended to increase difficulty and thereby enhance player engagement. However, the voice recognition control proved more challenging than traditional keyboard controls. The character's movement even varied with the loudness of the player's voice. Compounding this, the testing environment was quite noisy (eventually evolving into a game party), exacerbating the difficulty. Consequently, I plan to modify the game to feature fixed-position platforms that still ascend continuously. Further testing is required to determine the optimal configuration and spacing of these platforms.

Figure 4.17: Level 3 Game over menus

6. Discussion

In this article, I outline a series of iterative design models aimed at achieving a satisfactory player experience in educational games. However, this does not imply that the project is flawless or that the goal of facilitating language education through electronic means has been fully realized. The analysis in this paper largely relies on the limited snippets of Chinese language knowledge and Chinese cultural elements showcased in the project. Language learning still necessitates a long-term process of extensive systematic practice, and understanding and perceiving culture require deeper engagement in conversations. Drawing inspiration from the biblical narrative of the Tower of Babel, a timeless story that underscores the divergence of language as a source of human discord, but my work illuminates a vision where language becomes a unifying force, bridging

the chasms that separate tradition from modernity and oral communication from digital coding.

From the perspective of digital media technology and artistic expression, one of the objectives of this article is to explore how electronic video games can enhance language learning. The primary contribution of this project in this domain is an artistic experiment: to make language learning less rigid and serious, and to elevate electronic games beyond mere entertainment. This endeavor offers a unique lens through which we can perceive the ever-evolving role of language within the domain of contemporary art, provides a fresh perspective and creative inspiration for the future development of meaningful educational games with artistic value.

7. Conclusion

In this paper, I pose a question regarding the amalgamation o f ancient pictographs with modern digital technology: can thi s fusion enhance human emotional connections and social int eraction? My hypothesis is predicated on the innate human c apacity to interpret pictographs, combined with the use of mo dern electronic technology to augment visual impact and stim ulate multiple senses. This approach aims to explore how aud iences from diverse cultural backgrounds perceive unfamiliar languages. I have examined and substantiated this hypothesi s through a series of iterative design experiments.

In essence, my project demonstrates how the fusion of tradition and technology can give rise to a new artistic paradigm. In this fusion, the tales of antiquity, as found in the sacred texts of the Bible, acquire renewed significance in the context of our modern era, forging new connections across the epochs. Hieroglyphics, the great heritage that we have forgotten or ignored, are now being projected into the future through new practices of writing.

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