

Oracle Bone Uncoded: Bridging Mandarin Cultural Heritage and Modern Language Acquisition through Visual Narratives

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Abstract

Language acquisition is an intricate process that transcends rote memorization, requiring learners to connect meaning, form, and cultural context. This research delves into the complexities of Mandarin language learning, emphasizing the historical and cultural richness embedded in its characters. By transforming ancient illustrations that became the basis of contemporary Mandarin – also called "oracle bone script" – this work bridges historical heritage with modern educational techniques, creating an interactive digital platform where users engage with the evolution of Chinese characters, tracing their journey from ancient symbols to contemporary forms.

This project takes a visually immersive and storytelling-driven approach to help learners connect with Mandarin's logographic system. By weaving design and narrative together, it makes the learning process more engaging and helps with memory retention. Many non-native learners struggle with Mandarin characters because they often seem abstract, detached from their pictographic origins. This work aims to bridge that gap by showing how characters have evolved over time, making them feel more intuitive and connected to their history.

Beyond language learning, the project also highlights the role of design in preserving cultural heritage and fostering cross-cultural exchange. Visual narratives can communicate meaning beyond words, making Chinese history and language more accessible to a wider audience. By presenting Mandarin characters in a way that feels alive and emotionally engaging, this work reimagines language education as something more than just memorization—it becomes a way to reconnect with history, culture, and storytelling in a meaningful way.

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To my MDes 2023 cohort, thank you for your inspiration, collaboration, and shared learning. Our conversations and exchanges have profoundly enriched this work.

This thesis explores the intersection of cultural heritage, visual storytelling, and modern language acquisition. It is driven by a desire to create meaningful connections between the past and the present, fostering a renewed appreciation for Chinese cultural history through innovative design. As I reflect on the journey of crafting this work, I am reminded of the importance of storytelling in bridging divides—between languages, cultures, and even time itself.

In sharing this research, I aim to contribute to a broader dialogue about how we, as global citizens, can honour cultural histories while building tools for learning and understanding. I hope this work inspires others to explore the transformative potential of design in fostering cross-cultural connections rooted in respect, empathy, and creativity.

To everyone who has walked this path with me—thank you. Your support and belief in this project have been my guiding light.

Key Terms

Visual Storytelling

Refers to the use of dynamic visual narratives to convey meaning and context, making abstract or complex information more accessible and engaging (Gottschall, 2012). In this study, visual storytelling is used to bridge the historical evolution of Chinese characters from oracle bone script to modern forms, enhancing memory retention and cultural understanding. Visual storytelling serves as both a cognitive and emotional tool in language acquisition.

Oracle Bone Script

Oracle bone script is the earliest form of Chinese writing, dating back to the Shang Dynasty (circa 1600–1046 BCE). These inscriptions were primarily used for divination and record-keeping. Oracle bone script is significant for its visual and symbolic nature, which provides learners with a unique entry point to understanding the cultural and historical roots of Mandarin (Boltz, 1994).

Multimodal Learning

Multimodal learning engages multiple sensory modalities—visual, auditory, and kinesthetic—to enhance comprehension and retention (Mayer, 2001). This approach emphasizes flexibility, recognizing that not all learners process information the same way. By incorporating animations, sound effects, and interactive storytelling, this design ensures equitable access, adapting to diverse language backgrounds and learning preferences, and fostering deeper engagement for all users.

Cross-Cultural Communication (跨文化交流)

Cross-cultural communication refers to the exchange of ideas and meanings across different cultures. (Kane, 2006) In this study, it is facilitated through visual storytelling, which makes Chinese cultural heritage accessible to non-native learners and promotes mutual understanding.

Cultural Probe

Cultural probe is a method used to gather information about people and their activities in an unobtrusive manner, allowing them to self-reflect. (Gaver, Dunne, & Pacenti, 1999) In this study, it serves as inspiration for designing a language learning tool that resonates with learners' cultural and educational contexts.

Interactive Design

Interactive design refers to the creation of user-centred digital experiences that encourage active participation. (Norman, 2013) In this study, it is used to develop an app where learners navigate narratives, trigger animations, and explore the evolution of Chinese characters.

Introduction

Why This Study Matters

In learning a language, both communication and literacy play equally crucial roles. Yet, for many Mandarin learners, the complexity of Chinese characters creates a steep learning curve, making literacy a major challenge. Existing teaching methods often rely on rote memorization, treating characters as abstract symbols rather than meaningful visual narratives. My research addresses this issue by exploring how the historical evolution of Chinese characters—specifically from oracle bone script—can be leveraged to create a more intuitive and engaging learning experience.

This study proposes a new way of understanding Mandarin characters: rather than memorizing them in isolation, learners can explore their pictographic roots through visual storytelling. By tracing how characters evolved from ancient pictographs to modern script, learners can build stronger cognitive associations, improving retention and fostering a deeper cultural appreciation. This research is particularly relevant in an era where visual communication dominates digital interactions—if we can use images and icons to convey meaning globally, why not apply the same principle to learning Chinese?

In this thesis, I examine the historical significance of oracle bone script, analyze existing gaps in Mandarin education, and introduce a design-driven approach that reimagines character learning through interactive storytelling. Through experimental workshops and prototype testing, I evaluate the effectiveness of visual narratives in enhancing character recognition. My methodology combines semiotic analysis, cognitive learning theories, and participatory design research to develop an alternative, more immersive learning framework.

Background: The Visual Origins of Language

Humanity's earliest writing systems—from Mesopotamian cuneiform to Egyptian hieroglyphs—were not abstract symbols but visual narratives, encoding stories of survival, belief, and identity into tangible forms (Daniels & Bright, 1996). In China, this legacy is epitomized by oracle bone script (甲骨文), a 3,600-year-old writing system etched onto ox bones and turtle shells during the Shang Dynasty (c. 1600–1046 BCE). These inscriptions, primarily used for divination, fused art with language: the character for "rain" (𩇛) cascaded like falling droplets, while "mountain" (𡵓) rose in three peaks.

Yet today, Mandarin learners encounter characters as static, decontextualized shapes, divorced from their rich visual and cultural origins. Despite its historical significance, oracle bone script remains largely unfamiliar to the general public, even among native Mandarin speakers. As a Mandarin learner myself, my first encounter with these ancient inscriptions was not in a language textbook but in a museum display case. The intricate strokes seemed distant from the simplified characters I had been studying, yet I felt an undeniable connection between the two. That realization—that modern Chinese characters evolved from these pictographs—opened a new perspective on language learning, one that extended beyond rote memorization into a deeper exploration of cultural heritage.

The Visual Universality of Pictographs

The key to understanding Mandarin characters may lie in one of the oldest tools of human communication: the image. From ancient cave paintings to modern traffic signs, visuals can instantly convey meaning, bypassing language barriers. Chinese characters, which originated as pictographs, are part of this universal visual language. Take the character 水 (water), for example. Its evolution from the rippling waves of oracle bone script (𣎵) to its modern form still evokes the fluidity of water. If we could animate this progression, learners would not just see the character as a symbol but as a visual story of cultural change.

This approach aligns with dual coding theory, which suggests that combining images and words strengthens memory and understanding (Paivio, 1986). For non-native learners, this is especially powerful. Imagine a learner exploring the character 木 (mù, tree) through an interactive timeline. It begins as a simple sketch in oracle bone script “𣎵”, grows into “𣏟”(lín, 林/forest) with two trees, and then becomes “𣏟𣏟” (sēn, 森/dense woods) with three. Each step doesn’t just teach vocabulary—it reveals how ancient Chinese philosophy, such as Taoism’s reverence for nature, is embedded in the very structure of the language. This method not only helps with memorization but also ignites curiosity about the cultural significance behind the characters.

However, in traditional Mandarin education, this historical depth is often overlooked. As someone who has taught Mandarin to non-native speakers, I’ve seen this disconnect firsthand. One of my students, struggling to remember 家 (jiā, home)—a character that, in oracle bone script, shows a pig under a roof (𡩺)—expressed frustration: “Why does ‘home’ look like a math equation?” Her confusion reminded me of my own experience as a child in a museum, where ancient oracle bones were dismissed as “primitive script” rather than being presented as part of a rich cultural design system.

This reductive approach strips Chinese characters of their narrative richness, making them feel abstract and hard to remember. But what if we could experience language evolution, not just memorize it? What if the transformation of characters over time could unfold interactively, like a visual story, instead of being confined to dry textbooks?

Relevance and Importance: Literacy and Cultural Understanding

Mandarin’s logographic system poses unique challenges. Unlike alphabetic languages, where letters map to sounds, Chinese characters demand memorization of form, meaning, and cultural context—a triad rarely taught cohesively (Shen, 2013). For non-native learners, this often results in cognitive overload: 72% report character

recognition as their primary hurdle (CLTA, 2021). Meanwhile, native speakers, even in China, remain largely unaware of the stories behind their written language. Oracle bone script, despite being the foundation of Chinese characters, is relegated to academic niches, creating a cultural and pedagogical void.

This disconnect underscores a broader issue in language education: the privileging of utility over cultural narrative. As UNESCO warns, treating language as a transactional skill risks eroding its role as a vessel of intangible heritage. For Mandarin, this is particularly urgent. Characters like 舟 (zhōu, boat), which evolved from a canoe-shaped oracle bone pictograph (𦨇) to its modern form, carry millennia of technological and philosophical history—yet these layers remain invisible in most classrooms. By grounding language learning in visual storytelling, we honour Mandarin’s heritage while making it accessible to a global audience—proving that a character is not just a word, but a shared human experience etched in ink and time.

Objectives/Research Questions

This research seeks to address these gaps by leveraging visual storytelling and interactive design. By presenting characters as part of a historical and narrative journey, this approach aims to enhance memory retention, deepen cultural appreciation, and make Mandarin learning more intuitive. Guided by three research questions, the study aims to transform passive learning into an immersive, culturally grounded experience:

1. How can the transformation of oracle bone script into modern Chinese characters be visually represented to enhance memory retention?
2. In what ways can storytelling serve as an effective medium to bridge cultural heritage and modern language learning?
3. What design strategies can ensure an engaging and educational user experience for diverse learners?

Scope and Limitations

This project does not aim to develop a fully functional language-learning application but rather to explore an alternative learning approach that enhances Mandarin character recognition through visual storytelling and cultural narratives. By narrowing the scope to character recognition and historical narrative—rather than addressing grammar, phonetics, or full fluency—the research prioritizes depth in design experimentation and theoretical development. Additionally, due to technical constraints and the absence of a full development team, the project remains a conceptual prototype, visually demonstrating how interactive storytelling can support character retention and cultural appreciation rather than serving as a fully deployable digital tool. The study also has limitations in participant diversity, as insights were gathered through small-scale user testing and participatory design workshops rather than large-scale educational trials. While these constraints limit the project's generalizability, they allow for a focused exploration of visual narrative techniques, which can inform future applications in language education and cultural preservation.

Barriers

While the project successfully establishes a conceptual framework for visual-narrative-based language learning, several challenges emerged within the prototype development and potential adoption:

Technological Constraints: The project does not include a development team to build a fully functional application, which limits the scope to conceptual UI/UX design and interactive prototypes rather than a fully operational learning platform.

Educational Integration: Existing Mandarin curricula heavily emphasize rote memorization and phonetic drills, which may make it difficult for educators to integrate a narrative and visual-based approach without restructuring traditional teaching methods.

Cultural Accessibility: While Oracle Bone Script offers a rich historical perspective, its direct relevance for modern learners, particularly those outside of Chinese heritage communities, remains uncertain. The challenge lies in ensuring that the visual storytelling approach resonates across different linguistic and cultural backgrounds.

Empirical Validation: Since limited research exists on Oracle Bone Script as a pedagogical tool, measuring its effectiveness requires user studies and comparative research, which are currently beyond the project's prototype phase.

Literature Review

Research Gap Contribution

As I embarked on this project, I expected to find a wealth of research that examined the role of historical linguistic evolution in contemporary language learning. However, one of the most surprising—and in many ways, frustrating—discoveries was the scarcity of studies integrating oracle bone script into modern Mandarin education. Despite the well-documented challenges of learning Chinese characters, particularly for non-native learners, existing literature remains heavily focused on phonetics, stroke order, and memorization techniques, often overlooking the pictographic origins of the language and their potential as a learning aid.

This gap is also evident in popular language-learning applications. For example, Duolingo—a widely used platform—employs a gamified approach to teaching languages, focusing on exercises like translation, interactive activities, and quizzes to build vocabulary and grammar skills. While effective for many learners, Duolingo’s methodology does not explore the historical development or etymology of Chinese characters, thus missing an opportunity to connect learners with the rich visual history of the script.

Research into the inclusion of oracle bone script in educational resources is scarce. A recent survey by Zhang (2020) found that only 5% of educational tools for Mandarin learners integrate ancient scripts like oracle bone inscriptions. This lack of focus on oracle bone script contrasts sharply with its significance as one of the most crucial archaeological discoveries in Chinese history. In many instances, oracle bone script is mentioned merely as an introductory concept, often simplified to highlight its connection to modern characters, rather than being treated as a foundational aspect of learning Mandarin.

This absence of research points to a larger issue: the disconnect between traditional language pedagogy and the rich visual history of Mandarin script. While many studies have explored the cognitive benefits of visual learning (Mayer, 2001) and the impact

of multimodal instruction on memory retention (Paivio, 1986), few have applied these principles to Chinese language education in a way that acknowledges its historical evolution. Additionally, despite oracle bone inscriptions being one of the most significant archaeological discoveries in Chinese history, they remain largely unknown to the general public, even among native Mandarin speakers. This gap suggests the need for innovative approaches that bridge modern language acquisition techniques with historical and semiotic insights.

Literature Review: Semiotics and the Evolution of Chinese Characters

Semiotics, the study of signs and symbols, provides a foundational lens through which to examine how meaning is constructed, transmitted, and interpreted in language (Barthes, 1972). Roland Barthes, in his seminal work *Mythologies*, explores how signs—comprising both the signifier (form) and the signified (concept)—create meaning within cultural contexts. Unlike static representations, symbols evolve as they are reinterpreted through historical and ideological shifts. This perspective aligns with the transformation of the Chinese writing system, which began as a pictographic script and developed into a highly systematized logographic structure.

A key example of diachronic semiotics in Chinese script is the evolution of oracle bone script into modern Chinese characters (Boltz, 1994). For instance, the character 𠂇 (mǎ, 马/horse) originally depicted a detailed pictograph of a horse with a flowing mane and four legs. Over time, the form of the character simplified while retaining its core semantic meaning. Barthes' notion of semiotics suggests that while the signifier (the shape of the character) changed, the signified (the concept of a horse) remained consistent, demonstrating how linguistic symbols evolve through both formal abstraction and cultural reinterpretation. This process highlights how meaning is not only preserved but also transformed across different historical and social contexts.

Oracle bone script, as the earliest known form of Chinese writing, serves as a compelling case study in how historical forms of language shape cognitive and cultural understanding. Characters such as 豕 (jī, 豕/pig) originally depicted a pig

𡗗 (tún, 豕) beneath a roof (宀), signifying prosperity in agrarian Shang Dynasty society. However, modern pedagogy often isolates characters from their historical and cultural roots, reducing them to arbitrary symbols that learners must memorize through rote repetition. This severance from meaning aligns with DeFrancis' (1984) critique of script reform, which highlights how literacy policies have historically prioritized standardization over historical continuity, often at the expense of deeper linguistic engagement.

Research on heritage language education suggests that reintroducing historical and cultural context into language learning fosters deeper engagement and comprehension (Duff, 2015). These insights highlight the semiotic depth of Chinese characters and underscore the potential of reintegrating visual storytelling into language acquisition. By reconnecting learners with the origins and evolution of Chinese script, educators can bridge the gap between memorization-based learning and a more immersive, meaning-driven approach.

Literature Review: Multimodal Learning and Cognitive Retention

Multimodal learning theories provide a strong foundation for this research, supporting the integration of visual, auditory, and interactive elements to enhance language acquisition. Mayer's (2001) Cognitive Theory of Multimedia Learning emphasizes that learners retain information more effectively when presented with multimodal stimuli—such as images, animations, and text—because it reduces cognitive overload and enhances dual-channel processing.

Similarly, Dual Coding Theory (Paivio, 1986) suggests that the brain processes visual and verbal information through separate but interconnected pathways, reinforcing memory retention when both are activated simultaneously. The interactive transitions from pictographs to modern Chinese characters align with this principle, ensuring that learners build stronger associations between symbols and meanings.

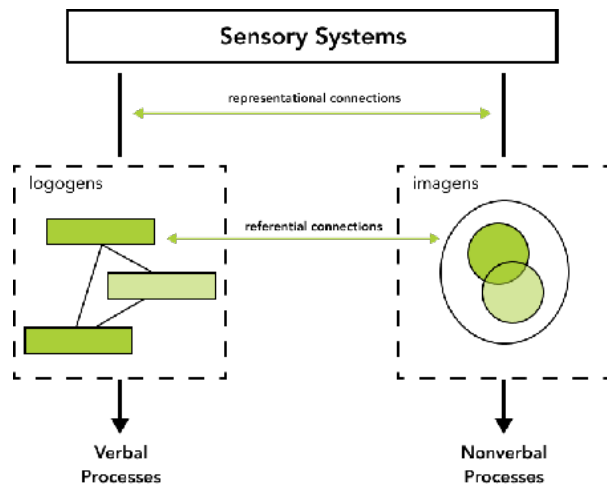


Figure 1: Oracle Bone characters integrated into visual scenes, blending ancient script with intuitive imagery.



Figure 2: The Panzani ad conveys "Italianicity" through colors, layout, and language, illustrating Barthes' second-order myth.

Additionally, modern Computer-Assisted Language Learning (CALL) and Mobile-Assisted Language Learning (MALL) frameworks emphasize multimodal engagement through text, visuals, and interactivity, optimizing retention and learner motivation (Stockwell, 2012). Mayer's Cognitive Theory of Multimedia Learning (2001) asserts that active participation enhances comprehension, a principle applied in game-based platforms like Duolingo. Research in spatial and temporal mapping (Tversky, 2019) further demonstrates that navigating visual narratives strengthens conceptual understanding, reinforcing why the transformation of characters over time should be presented through a sequential, interactive format. Studies on gestural interaction and kinesthetic engagement indicate that active participation in visual storytelling enhances cognitive connections (Goldin-Meadow, 2003), an insight that guides my design approach. Despite this body of research, most Mandarin learning tools still prioritize rote memorization over immersive experiences. My project seeks to address this gap by redefining character acquisition through interactive visual storytelling, providing an engaging, cognitively enriched learning experience.

Literature Review: Narrative-Based Learning and Engagement

Narrative-based learning has been widely recognized as an effective pedagogical approach, particularly in second-language acquisition. Gottschall (2012) argues that humans are inherently wired for storytelling, with narratives serving as a cognitive framework that enhances comprehension, retention, and emotional engagement. This aligns with Bruner's (1991) theory of narrative cognition, which suggests that people make sense of the world through stories rather than isolated facts. In the context of language education, embedding linguistic elements within meaningful story structures not only aids in recall but also provides contextual depth to vocabulary and grammar acquisition.

Additionally, Kramsch (1998) highlights that language learning is inseparable from the cultural and historical contexts in which it evolves. She asserts that stories serve as cultural artifacts, embedding linguistic structures within real-world traditions, histories, and lived experiences. This perspective aligns with studies on experiential learning, such as Kolb's (1984) framework, which emphasizes learning through immersion and experience rather than rote memorization. In second-language learning, narratives allow learners to see words in action, making abstract concepts more tangible and memorable.

The intersection of narrative-based learning and digital storytelling has been explored in contemporary educational research. Robin (2008) posits that digital narratives—incorporating text, imagery, and animation—enhance learner engagement by providing multi-sensory input, reinforcing memory retention. In the context of Mandarin learning, visualized character evolution can function as a form of interactive historical storytelling, making the transition from oracle bone script to modern Chinese characters a lived experience rather than an abstract process. For instance, the transformation of characters like 人 (person) and 口 (mouth) from oracle bone script to their modern forms illustrates how visual narratives can bridge linguistic learning with cultural history (see Figure 3). These insights reinforce the importance of incorporating interactive chapter-based story sequences, where learners uncover the meaning behind characters through their historical usage.

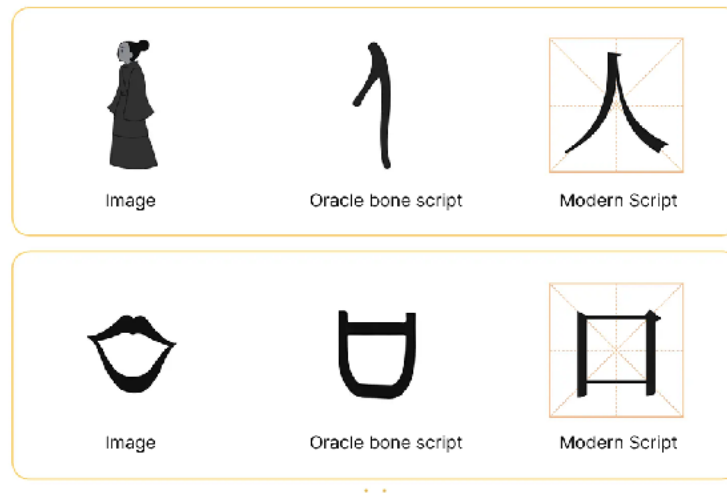


Figure 3: Evolution of 人 (person) and 口 (mouth) from oracle bone script to modern forms, highlighting the role of visual storytelling in character recognition.

Literature Review: Cultural Heritage and Language Learning

The connection between language learning and cultural heritage has been widely explored in applied linguistics and heritage language education. Duff (2015) emphasizes that learners who engage with a language's historical and cultural context develop a stronger emotional and cognitive connection to it. However, many contemporary Mandarin education programs prioritize functional literacy, focusing on grammar and vocabulary rather than deeper cultural immersion. This approach often detaches learners from the historical richness of Chinese characters, presenting them as abstract symbols rather than cultural signifiers rooted in centuries of evolution.

Digital storytelling has been recognized as a powerful tool for language preservation and cultural sustainability. Harrison (2020) highlights how integrating historical narratives into educational technologies enhances retention while fostering cross-cultural understanding. Similarly, Liu and Wu (2021) examine digital pedagogy and historical reconstruction, demonstrating that reanimating ancient scripts allows learners to visualize linguistic evolution, reinforcing both memory and cultural appreciation.

Beyond language acquisition, writing systems themselves function as cultural artifacts that bridge past and present. Coulmas (2003) argues that characters are not merely linguistic units but also repositories of cultural memory. This perspective aligns with semiotic theory, which suggests that symbols evolve not just in form but in meaning over time. By embedding oracle bone script within an interactive, visually-driven platform, learners experience character transformation as part of a historically contextualized process, rather than as isolated memorization tasks.

Literature Review Conclusions: Bridging Historical Semiotics and Modern Learning

Despite extensive research in semiotics, multimodal learning, and narrative-based education, there is a significant gap in integrating oracle bone script into modern Mandarin instruction. Most studies focus on functional literacy and rote memorization, overlooking the potential of historical narratives and visual storytelling to enhance engagement and retention.

While narrative-based learning (Gottschall, 2012; Bruner, 1991) and digital storytelling (Robin, 2008; Harrison, 2020) are acknowledged as effective tools for language retention, their potential in Mandarin character education remains underexplored. The historical transformation of Chinese script offers an untapped opportunity to deepen cultural appreciation, improve retention, and motivate learners. Current research tends to prioritize functional literacy and grammar instruction, missing how historical narratives and interactive storytelling could bridge linguistic memory with cultural understanding.

Additionally, while heritage language education (Duff, 2015) emphasizes the importance of cultural context, modern Mandarin tools rarely integrate historical semiotics as an active learning component. This leaves learners disconnected from the pictographic origins of the language, limiting engagement with Mandarin as a dynamic, evolving system.

This project aims to address these gaps by exploring how interactive storytelling and visual narratives can reintroduce oracle bone script into Mandarin learning. By combining historical linguistics with digital design, it offers an immersive, culturally enriching approach aligned with contemporary multimodal learning theories. It also calls for future research integrating historical semiotics, narrative-based learning, and interactive education to revitalize language acquisition.

Design Practice

Phase 1: Exploring Sensory Modalities in Mandarin Learning

1.1 Integrating Auditory, Visual, and Tonal Elements

In the first phase of my research, starting in February 2024, I explored multiple sensory modalities in Mandarin learning with the goal of integrating both auditory and visual elements for a more intuitive and engaging experience. Recognizing that tonal accuracy is critical for communication, I also acknowledged that the evolution of Chinese characters plays a crucial role in literacy and comprehension. Initially, I sought a balance between these elements, assuming that multimodal learning—such as pitch visualization and embodied interaction—could enhance tonal acquisition.

To test these methods, I conducted a series of workshops and observations throughout February and March 2024, aiming to determine whether incorporating visual and auditory elements would improve learners' ability to retain tones. However, I encountered an unexpected challenge: learners became overly focused on reproducing pitch contours rather than engaging with the language in a meaningful way. The process felt mechanical, and tones remained abstract without a tangible, immersive anchor beyond sound.¹ Despite their best efforts, progress was slow, and the learning experience lacked emotional connection. These early experiments provided valuable insights into how learners process tonal information and revealed both the potential and limitations within the scope of my research.

¹ Mandarin's tonal system is integral to the language's structure, where four primary tones (flat, rising, dipping, falling) influence meaning. For instance, "ma" can represent "mother" (妈, mā), "hemp" (麻, má), "horse" (马, mǎ), or "scold" (骂, mà), depending on the tone. This complexity presents a challenge for non-native learners, as tonal distinctions often require subtle auditory discrimination and motor control, skills less developed in speakers of non-tonal languages (Wang, Jongman, & Sereno, 2001).

1.2 Shifting Focus: From Tonal Learning to Visual Storytelling

This realization led me to rethink my approach. Rather than prioritizing sound alone, I introduced visual storytelling through oracle bone script. Unlike tonal drills that required constant correction, oracle-based learning provided a historical and cognitive bridge, making characters more than just symbols to memorize. Seeing how early pictographs evolved into modern forms allowed learners to uncover embedded stories—deeply rooted in ancient cosmology and human instinct for visual representation.

One session particularly reinforced this shift. When participants matched the oracle bone form of "fire" (𤇑) to its modern script (火), one learner hesitated before selecting the correct character, then remarked, "It looks like flames flickering up. I can see why it meant fire." This simple yet profound moment revealed what was missing in tonal training—a sense of intuitive discovery. Unlike tones, which required external reinforcement and careful calibration, characters embedded in visual narratives spoke to something innate: the human ability to derive meaning from images.

1.3 Transitioning to Historical Narratives for Deeper Learning

This insight aligned with narrative cognition theory (Bruner, 1991) and multimodal learning research (Kress & van Leeuwen, 2006), both of which emphasize that humans retain information more effectively when it is part of a story rather than an isolated fact. Instead of treating Mandarin as a collection of abstract symbols, I reframed it as an evolving system of meaning shaped by centuries of cultural continuity.

As a result, my research naturally shifted from exploring various sensory modalities to focusing on historical visual narratives. Given the lack of existing research on oracle bone script in language learning, narrowing my focus allowed for a deeper investigation into its pedagogical potential. This transition laid the foundation for my next phase of research—the Character Learning Workshop, where I further developed an interactive, visually immersive method for understanding Chinese script.

Phase 2: Character Matching Workshop – Tracing the Evolution of Chinese Characters

2.1 The Glyph Evolution Matching Game

In April 2024, during the second phase of my research, I transitioned from focusing on tonal exercises to addressing a new challenge—helping learners intuitively engage with Chinese characters through their visual and historical roots. Instead of treating characters as abstract symbols to be memorized, this phase emphasized their transformation over time and the connections between imagery and writing. This led to the development of the Character Matching Workshop, an interactive exploration of how Chinese script evolved across history.

At the core of the workshop was a glyph evolution matching game, where participants traced the transformation of characters through three key historical stages (see Figure 4):

Central to this experience was a glyph evolution matching game, which visually mapped characters across three key historical stages:

1. Oracle Bone Script (象形文字): the earliest form, where characters closely resemble the objects they represent.
2. Small Seal Script (小篆): a more refined and standardized form, bridging pictographs with more abstract representations.
3. Modern Regular Script (楷书): the structured script used in contemporary Chinese.

These stages were chosen to highlight some of the most significant transformations in Chinese characters, making their evolution easier to grasp. By engaging with these visual shifts, participants were able to observe patterns, draw connections between historical and modern forms, and reflect on how meaning is carried through different writing styles over time.



Figure 4: The main scripts of Chinese characters illustrated using the commonly used character “来” (lái)

2.2 Hands-on Learning with Visual Cues

To begin the workshop, participants were provided with pictorial icons—simple illustrations representing the original meaning of selected characters. Using these visual cues, they first identified the corresponding Oracle Bone Script characters, making direct connections between the images and early writing. Once they identified an Oracle Bone character, they then searched for its Small Seal Script equivalent, using structural clues to guide their choices.

If participants struggled to match the characters at this stage, they could reference the Modern Regular Script first and work backward, reasoning through the character’s structural evolution. This flexible approach allowed for both intuitive discovery and pattern recognition, ensuring that participants engaged actively with the character transformations rather than relying solely on rote memorization.

2.3 Exploring Meaning Through Matching

By interacting with characters through images first, participants were encouraged to think beyond static symbols and explore how writing emerged from visual

representation. The step-by-step matching process reinforced how meaning is embedded within character structures, rather than treating them as arbitrary shapes.

Instead of a rigid testing environment, the workshop was designed as an open-ended, exploratory experience, where participants engaged in observation, discussion, and interpretation. This method of progressive discovery aligns with multimodal learning theories (Kress & van Leeuwen, 2006), emphasizing the role of visual and contextual associations in language acquisition.

By reframing Chinese character learning as an evolving visual system, this approach makes Mandarin's logographic script more accessible—especially for those unfamiliar with its historical depth.

2.4 Learning Through Discovery: Key Character Examples

Certain characters sparked particularly engaging discussions:

“山” (mountain): The oldest form of this character resembled three jagged peaks, a direct pictorial representation of a mountain range. As participants followed its transformation through Small Seal Script to its modern form, they noticed how the peaks became more compact and abstract. Some observed that this pattern mirrored how human perception simplifies complex forms for easier recognition and writing.

“门” (door): The Oracle Bone Script for “door” depicted a simple frame with two vertical bars—immediately recognizable as a doorway. As they traced its evolution, participants discussed its symbolic meaning beyond a physical entrance. The phrase “入门”, meaning “entering a door,” is commonly used in Mandarin to mean getting started with something new. This realization resonated with many, as they likened learning a new language to stepping through a doorway into new experiences.

2.5 Collaboration and Emotional Engagement in Learning

Unlike the solitary nature of tonal training, the Character Matching Workshop emphasized collaboration and shared exploration. Participants worked in groups, debating and discussing the meanings behind characters rather than simply memorizing them. This shift in dynamic fostered a sense of community, making learning more interactive and enjoyable.

A pivotal moment came when participants noticed parallels between early Chinese inscriptions and other ancient writing systems, such as Egyptian hieroglyphs and Sumerian cuneiform. This sparked cross-cultural discussions, helping learners see Mandarin as part of a broader human tradition of visual communication rather than an isolated language. These connections deepened their appreciation of Chinese characters as not just written symbols, but as carriers of historical and cultural significance.

2.6 Insights and Outcomes from the Character Matching Workshop

The first attempt at the matching game yielded surprising results. Even participants with no prior knowledge of Chinese characters achieved an initial accuracy rate of nearly 50%, far exceeding expectations (see Figure 5-7). This suggested that even without formal exposure, learners could intuitively connect modern characters to their ancient forms through visual memory.

In the reverse matching phase, where participants matched modern characters back to their Oracle Bone Script forms, the results were even more impressive—100% accuracy. This confirmed the power of image-based learning in character retention. Participants had internalized character evolution, making recall effortless and intuitive.

Another notable insight came when we removed the Oracle Bone icons from the final exercises. Learners had to rely solely on memory, reinforcing their ability to recall meanings without visual cues. Over time, their connection to the characters became

more natural and intuitive, proving that visual associations acted as cognitive anchors for retention.



Figure 5-7: The matching game process: Figure 5 shows participants making initial associations between modern characters and their ancient forms; Figure 6 highlights incorrect matches (marked in blue); Figure 7 presents the corrected matches after feedback, illustrating the improvement in character recognition.

This workshop provided valuable insights that shaped the next phase of my research:

1. **Characters as Evolving Visual Stories:** The integration of character evolution and historical context transformed learning from rote memorization into an engaging narrative experience. This approach fostered deeper engagement by embedding characters in cultural and historical narratives.
2. **Visual Memory as a Retention Tool:** The combination of imagery and storytelling enhanced retention, with participants not just recognizing characters, but

understanding their historical context and meaning. This reinforced the value of visual memory in language acquisition.

3. Visual Language as an Inclusive Learning Tool: Unlike phonetic learning, which is often tied to linguistic backgrounds, visual representation transcends language barriers. Images provided a universal entry point, enabling diverse learners to engage with Chinese characters interactively and inclusively.
4. Cross-Cultural Connections: Participants also recognized parallels between Oracle Bone Script and other ancient writing systems, such as Egyptian hieroglyphs and Sumerian cuneiform. This cross-cultural recognition broadened their understanding of Mandarin as part of a shared human tradition of visual communication

These findings of my second phase of design output laid the groundwork for my next design step—an interactive Oracle platform that would present Chinese characters as evolving visual narratives. By blending history, imagery, and gamified learning, this platform would offer learners a dynamic, immersive way to explore Mandarin beyond rote memorization.

Phase 3: Visualizing Oracle Bone Script

Before developing Oracle Uncoded as a digital platform in my third phase of research output, I went through a stage of visual and narrative exploration. This stage involved creating illustrations and storyboards to break down and present the evolution of Oracle Bone Script. I wanted to test how different visual approaches could shape people's understanding and curiosity toward these ancient characters. These works were later exhibited during the Fall 2024 Open Studio event in October 2024, a school-wide showcase where designers present their works in an open exhibition space, allowing visitors to explore and engage with the projects while creators remain present for discussion. This setting provided me with the opportunity to observe how people naturally interacted with the illustrations and gather valuable feedback that would shape my final design.

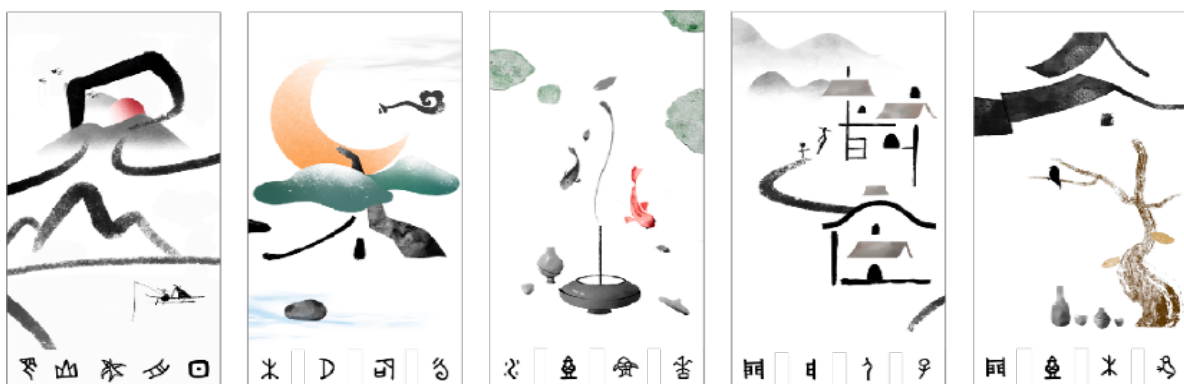
3.1 Illustration Experiment: Deconstructing and Reconstructing Oracle Bone Script

The third and final phase of my studio output began with an illustration-based approach, focusing on the fundamental structures of Oracle Bone characters. I selected a series of characters with strong pictographic qualities and integrated them into visual compositions that merged their ancient forms with contemporary imagery. Each illustration was designed using four to five Oracle Bone characters, forming a cohesive scene that reinterpreted their meaning in a new visual context.

1. 见 (see) 山 (mountain) 燕 (swallow) 舟 (boat) 日 (sun): (see figure 8). At the peak of a mountain, a 燕 (swallow) soars through the sky, framing a celestial gateway where the 日 (sun) rises. The character 见 (see) is abstracted into the composition, subtly embedded as a passage leading up the mountain. Below, a 舟 (boat) drifts on distant waters, adding a sense of scale and movement to the landscape.
2. 木 (tree) 月 (moon) 石 (stone) 云 (cloud): (see figure 9). A 木 (tree) stretches upward, its branches merging with drifting 云 (clouds). The 月 (moon) hangs above, while a 石 (stone) remains grounded at its base.

3. 水 (water) 壺 (pot) 鱼 (fish) 香 (fragrance): (see figure 10). A 鱼 (fish) swims through flowing water, passing a floating 壺 (pot). The rising 香 (fragrance) echoes the shape of the character 水 (water), blending form and meaning.
4. 门 (door) 户 (house) 人 (person) 子 (child): (see figure 11). A 人 (person) walks along a path with 子 (child) on the way home. The open 门 (door) in the distance hints at warmth and familiarity, captures the warmth and continuity of generations through movement and connection.
5. 门 (door) 壺 (pot) 木 (tree) 鸟 (bird): (see figure 12). A withered 木 (tree) stands beneath a rooftop, with a 鸟 (bird) resting on its branches. Below, a set of 杯盞 (cups) sits in quiet stillness, evoking the presence of time and tradition within the everyday.

These illustrations were not just about visually representing Oracle Bone characters but about exploring their poetic and symbolic nature. By placing them within contextualized scenes, I sought to highlight their inherent narrative quality, allowing viewers to engage with them not just as symbols but as living elements within a story.



Figures 8-12 (From left to right): Oracle Bone characters integrated into visual scenes, blending ancient script with intuitive imagery.

3.2 From Writing System to Sensory Experience

This process deepened my understanding of Oracle Bone Script as more than just a writing system—it was an artistic, symbolic, and deeply human way of recording the world. Unlike modern alphabets, which are often arbitrary, these characters are intuitive, born from direct observation of nature and human life. They have a tactile quality, a sense of connection to the materials they were carved onto, and the rituals they were part of. This realization led me to think beyond the idea of “language learning” and instead focus on the emotional and sensory pull these characters have. If Oracle Bone Script itself holds a natural magnetism, then my role was not to “teach” but to design an experience that makes people want to explore it.

3.3 Storyboard Experiment: Bringing Oracle Bone Script to Life

Beyond standalone illustrations, I also experimented with storyboards in November 2024 to explore how these characters could unfold within a narrative. Instead of presenting them as isolated symbols, I wanted to place them into fluid, living environments, where their meaning could emerge naturally through motion and transformation.

I created three short story sequences, each revolving around a single Oracle Bone character (see figure 13):

1. 舟 (boat): A small wooden boat sets off on a long voyage, collecting objects and encountering different creatures along the way. Each stop adds something new to its story, making it more than just a vessel—it becomes a collection of memories, shaped by the places it has been.
2. 石 (stone): A stone falls from a cliffside and lands in a valley. Over time, it remains unchanged as the seasons shift around it—trees grow beside it, rivers flow past, and yet the stone stands still, a silent witness to time.

3. 鱼 (fish): A fish journeys through different waters, experiencing shifts in climate and environment. As the seasons change, it observes people by the riverbank, watching them gather, converse, and celebrate under falling leaves. The fish moves forward, adapting and continuing its journey.

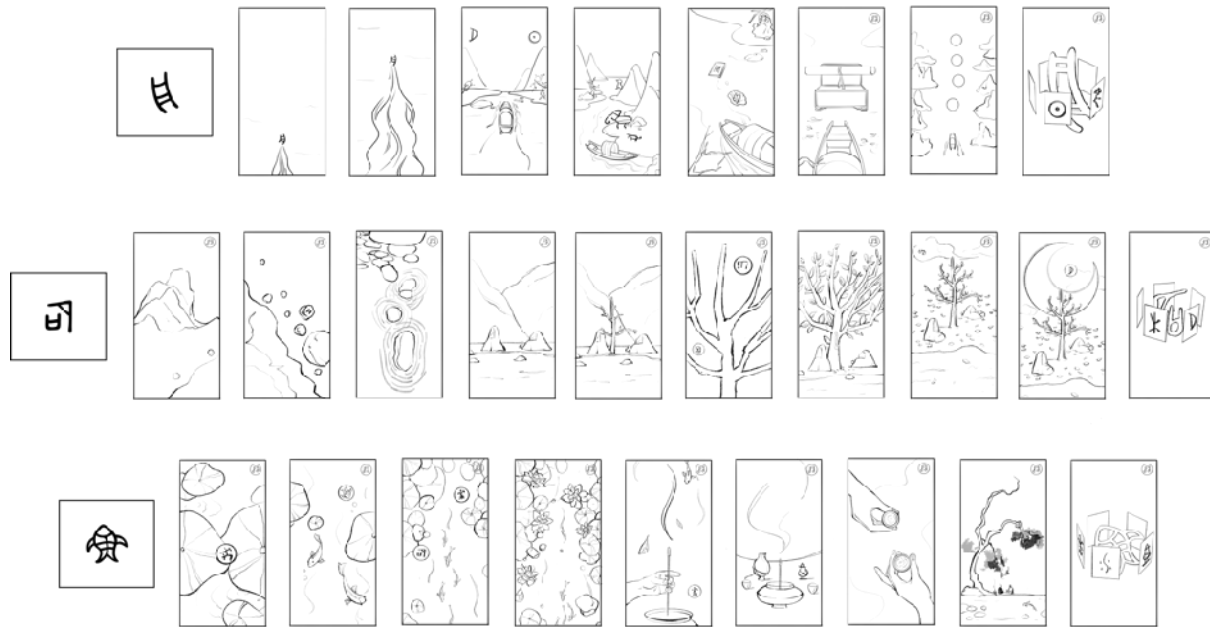


Figure 13: Storyboards illustrating the journey of Oracle Bone characters, read from top to bottom—舟 (boat), 石 (stone), and 鱼 (fish)—each representing themes of time, change, and continuity.

These storyboards were displayed sequentially at Open Studio, allowing viewers to follow the narratives at their own pace. I noticed that instead of just skimming through, people paused, observed, and engaged—they followed the flow of the story, anticipating what might happen next. Some even started making their own interpretations, such as what the boat might collect next.

This reaffirmed my belief that narrative adds an emotional and immersive layer to learning. A character alone might feel abstract, but when placed within a story, it gains texture, movement, and personal relevance. More importantly, I wanted to break away from the traditional approach of memorizing Chinese characters in isolation. Instead of seeing "石" (shí, 石/stone) as just a single entity, I wanted people to recognize its

qualities—steadfastness, resilience, and permanence—and associate it with broader ideas. Similarly, " 𣎵 " (mù, 木/tree) is always growing, alive, reaching upward, while " 𠩺 " (stone) remains unshaken, a symbol of endurance. These contrasts are embedded in language and culture, forming a deeper understanding of how these symbols function beyond their literal meanings.

3.4 Observations & Design Insights: From Teaching to Inviting Curiosity

During the Open Studio event, I intentionally refrained from explaining my Oracle bone inscriptions visualizations and instead observed how viewers interacted with it. The responses were fascinating—some tried to decipher the characters instinctively, while others were drawn to the aesthetic and lingered in front of the illustrations. Some viewers engaged in discussions, pointing out different elements and questioning their connections, while a few asked about the relationship between Oracle Bone Script and modern Chinese characters.

However, I also noticed that for some, the meaning of certain characters was not immediately clear. This highlighted that while the visual approach was engaging, providing some form of context or narrative could help bridge the gap between intuition and understanding. A balance between pure visual experience and subtle guidance was necessary to deepen engagement.

These observations reshaped my approach to Oracle Uncoded. Rather than seeing it purely as a teaching tool, I began to view it as a platform designed to spark curiosity. Language learning is not just about acquiring information; it is about fostering a desire to explore and a drive to understand. My goal was to create an experience where discovery unfolds organically, where engagement is driven by curiosity and personal interest, rather than obligation.

In its final form, Oracle Uncoded is designed as an interactive space where users can explore, play, and gradually develop their connection to ancient characters. The aim is to leave participants intrigued, prompting them to seek further knowledge and explore the origins of the characters on their own.

Final Design: The Oracle Uncoded Platform

Platform Development & Interactive Experience

Oracle Uncoded is designed as an interactive, web-based platform that invites users to explore the evolution of Oracle Bone Script through a combination of structured narratives, modular interactions, and personalized engagement mechanisms. The final platform was built using Figma for initial interface prototyping, where I developed animated transitions that simulate the fluid progression from one visual component to another. This approach allowed for testing different ways of presenting Oracle Bone characters—either as standalone symbols or as part of a connected visual journey—to evaluate how users engage with and interpret them.

Unlike conventional static language learning tools, Oracle Uncoded employs an explorative, game-like structure where users follow a semi-guided narrative path. While the experience has a predetermined storyline, users are given the freedom to navigate sections at their own pace, selecting different branches to deepen their engagement. Through animation, users can witness how Oracle Bone characters gradually morph into their later script forms, reinforcing a visual and cognitive connection between ancient and modern Chinese writing.

Detailed interface mockups and UI elements of the Oracle Uncoded platform can be found in the appendix section. All visual assets, including illustrations and historical references, are derived from public domain materials.

Collection & Personalized Engagement

A core feature of the final Oracle Uncoded project is its dynamic collection system, which encourages users to gather and curate characters as they explore the platform. Each character is presented in various contexts—through illustrated scenes, animated transformations, or interactive storyboards—creating a more immersive experience. Users can organize their personal collection, reviewing and accessing expanded

meanings, historical significance, and symbolic interpretations. This approach allows them to revisit characters with greater depth, understanding not only their structural evolution but also their cultural relevance.

For example, when users encounter the character for "bird" (鸟), it is first placed in a narrative that emphasizes its symbolic meanings, such as its association with freedom and nature in early Chinese thought. They begin by viewing its Oracle Bone Script form. Upon clicking, the character transforms into an image of a bird, accompanied by two related Oracle Bone characters like "chicken" and "hawk" (see figure 14). The experience deepens as users progress through a visual narrative that further connects the bird to its symbolic meanings. The journey culminates with the display of a cultural artifact, such as the Song Dynasty painting *Goshawk on Autumn Liquidambar Tree Eyeing a Pheasant*, which ties the character to ancient Chinese representations of birds. This progression not only reinforces the character's structure but also highlights its broader cultural significance. Through this layered, non-linear system, Oracle Uncoded fosters deeper cognitive and cultural understanding, encouraging users to engage in a personalized and meaningful learning experience.



Figure 14: The Oracle Bone Script form of the character 'bird' (鸟) is showcased through interactive visuals and related characters, highlighting its symbolic and cultural significance.

Visual Design & Aesthetic Choices

The platform's visual design draws inspiration from Song Dynasty classical Chinese paintings, incorporating elements such as ink wash textures, aged paper backgrounds, and traditional color palettes. To achieve this, I extracted elements from traditional paintings using Procreate, carefully cutting out sections and adjusting color tones for consistency. The final compositions involve layering historical artworks, refining textures, and utilizing collage techniques to merge ancient aesthetics with modern digital interaction seamlessly.

This stylistic approach enhances the cultural authenticity of the experience while making the interface visually compelling. By preserving the tactile qualities of traditional Chinese scrolls—such as paper texture and natural pigment variations—the platform invites users into a space where language learning becomes an artistic exploration. Through these design choices, Oracle Uncoded not only educates users about ancient Chinese script but also immerses them in the broader visual heritage of Chinese history.



Figure 15: Extracted elements from Song Dynasty paintings—a fish illustration and a floral composition—refined and color-restored to preserve historical authenticity.

Spaced Repetition in Oracle Uncoded: Dynamic Progress Tracking

Spaced repetition is a learning principle that enhances retention by reviewing information at strategically timed intervals. First described by German psychologist Hermann Ebbinghaus in the 19th century, the spacing effect suggests that periodically revisiting material strengthens memory consolidation and reduces cognitive overload (Ebbinghaus, 1885). By reinforcing knowledge just before it fades, learners develop deeper, long-term recall.

In Oracle Uncoded, this principle is reflected in the dynamic progress tracking system, where users are prompted to revisit content they've previously encountered. Each scroll in the system visually represents the user's progress, and the yellowing or fading effect serves as a subtle reminder to engage with past material. When users neglect to revisit chapters, the scroll begins to fade, symbolizing the diminishing strength of their recall (See Figure 15). In order to restore the scroll to its original vibrant state, users are encouraged to review and interact with the material again, thereby reinforcing their long-term retention.

This evolving visual system transforms progress tracking into an interactive learning experience, fostering a sense of ownership and motivation. As users continue their journey, a growing collection of restored scrolls reflects their accumulated knowledge, making the process both rewarding and immersive.



Figure 16: Visual representation of the spaced repetition system: scrolls fade and roll up over time.

A Holistic & Inclusive Learning Experience

Oracle Uncoded is more than a language-learning tool—it is a platform designed to spark curiosity and bridge historical knowledge with modern digital interaction. By integrating interactivity, storytelling, and visual engagement, it transforms the study of Oracle Bone Script from a passive memorization task into an exploratory and immersive experience. Its modular structure allows users to navigate their own learning paths, accommodating different preferences and cognitive styles. Whether through visual storytelling, interactive discovery, or structured review mechanisms, Oracle Uncoded adapts to each user's journey.

Accessibility and inclusivity are central to its design. By using visual metaphors, animations, and contextualized learning, the platform ensures that users from diverse linguistic backgrounds can engage meaningfully. Since Oracle Bone Script represents the earliest form of Chinese writing, no prior Mandarin proficiency is required, making the experience welcoming to both heritage learners and newcomers alike. Additionally, users can contribute their own interpretations and creative extensions, fostering a collaborative and evolving learning community.

The integration of traditional Chinese artistic elements—such as hand-painted textures, aged paper aesthetics, and layered compositions—further strengthens the connection between history and modern interaction. This design choice enhances cultural authenticity while making the experience more immersive and emotionally resonant. Looking ahead, Oracle Uncoded has the potential to expand with features like crowdsourced storytelling, multi-sensory interactions (such as audio and tactile feedback), and AI-powered personalized learning paths.

Ultimately, Oracle Uncoded reimagines the study of ancient scripts—not as relics of the past, but as living symbols that continue to evolve with each user's engagement. By fostering curiosity and cultural appreciation, it transforms learning into a dynamic and meaningful journey.

Discussion

Implications: A Modular Learning Framework

The development of Oracle Uncoded has significant implications for the future of language education by challenging conventional methods that prioritize memorization and structured drills. Rather than relying on rote learning, Oracle Uncoded demonstrates that language acquisition can be enriched through visual storytelling, historical immersion, and symbolic associations. By treating characters as dynamic elements of a cultural ecosystem, the platform fosters an intuitive, emotionally resonant connection with the script, allowing users to internalize them in a more meaningful and holistic way.

The platform introduces a new educational design paradigm by moving away from rigid, linear curricula toward a more flexible, exploratory structure. This approach can be adapted to languages with complex scripts or historical depth, such as Egyptian hieroglyphs, Mayan glyphs, or non-Latin scripts like Arabic, creating immersive, discovery-driven learning environments. With its use of digital storytelling, collage-based learning, and interactive progress tracking, Oracle Uncoded offers a model where learners take control of their journey, making the experience more engaging and personalized.

Additionally, Oracle Uncoded demonstrates the power of integrating multi-sensory, contextually rich content into digital learning tools. As technology advances, the platform has the potential to expand its features to include audio, tactile feedback, and AI-driven customization, further enhancing the immersive learning experience.

Ultimately, Oracle Uncoded answers the research question by demonstrating that language is not just a set of arbitrary symbols but a living, evolving medium deeply connected to cultural heritage. Research indicates that learners connect more meaningfully with language when it is embedded in a broader narrative and visual context (O'Neill, 2020). By providing users with insights into the historical roots and

cultural significance of characters, the platform enriches the learning experience beyond mere repetition, encouraging deeper engagement and understanding.

The broader implication is clear: the future of language learning tools lies in their ability to foster a deeper, more personal connection with the language being studied. Through its integration of cultural context, history, and interactive design, Oracle Uncoded paves the way for a more holistic, engaging, and effective approach to language education.

Future Research

Language is more than just a tool for communication—it is a living archive of human history, carrying the weight of cultural identity, artistic expression, and ancestral knowledge. As Oracle Uncoded continues to grow, I see it not merely as a language-learning platform but as part of a larger movement—a call to rethink how we preserve and engage with linguistic heritage in an increasingly digital world.

The next phase of this research will focus on refining and expanding the framework I have developed. Oracle Uncoded's integration of hand-drawn elements, collage-based storytelling, and interactive design holds the potential to transform not just language education but also broader fields like historical preservation and cultural storytelling. Through user studies with heritage learners, non-native speakers, and children, I aim to gain deeper insight into how different audiences engage with this method and how interactive, sensory-rich learning environments can foster more meaningful connections with language.

But this project extends beyond Mandarin. Every ancient script—whether Egyptian hieroglyphs, Mayan glyphs, or other endangered writing systems—represents a thread in the fabric of human civilization. Yet as modern education systems prioritize efficiency and standardization, these scripts risk fading into obscurity, their cultural depth flattened into museum artifacts. Oracle Uncoded offers a different vision: one

where technology does not replace history but revitalizes it, transforming learning into an active form of cultural preservation.

The urgency of this work is real. Language loss is accelerating, and with it, entire worldviews and artistic traditions are at risk of disappearing. But what if we could shift that trajectory? What if interactive storytelling, visual metaphors, and digital immersion could make ancient scripts not only accessible but deeply engaging—something new generations want to learn, not just something they should?

This research is not about following trends—it is about redefining what language education can be. Oracle Uncoded is a testament to the idea that learning should not only inform but inspire. It is an invitation to explore, to rediscover, and to take part in the shared responsibility of preserving linguistic and cultural heritage. By pioneering this approach, I hope to open up new conversations about the role of technology in safeguarding our collective human story—one character at a time.

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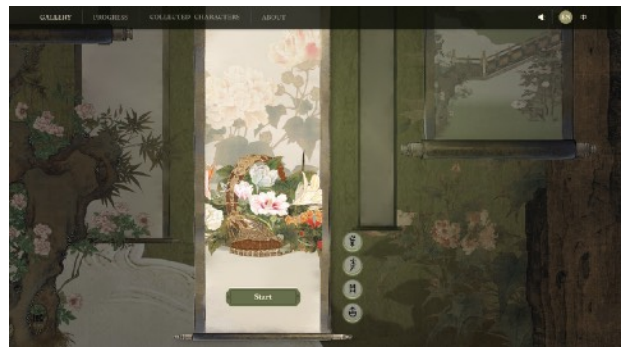
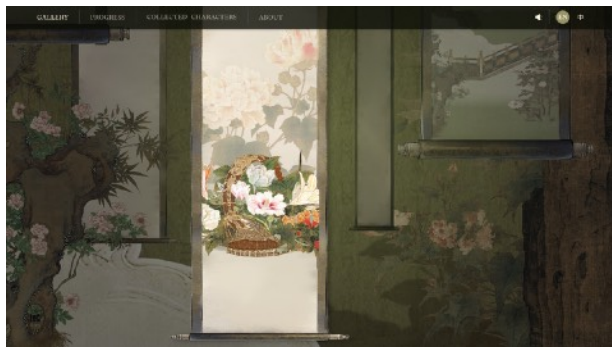
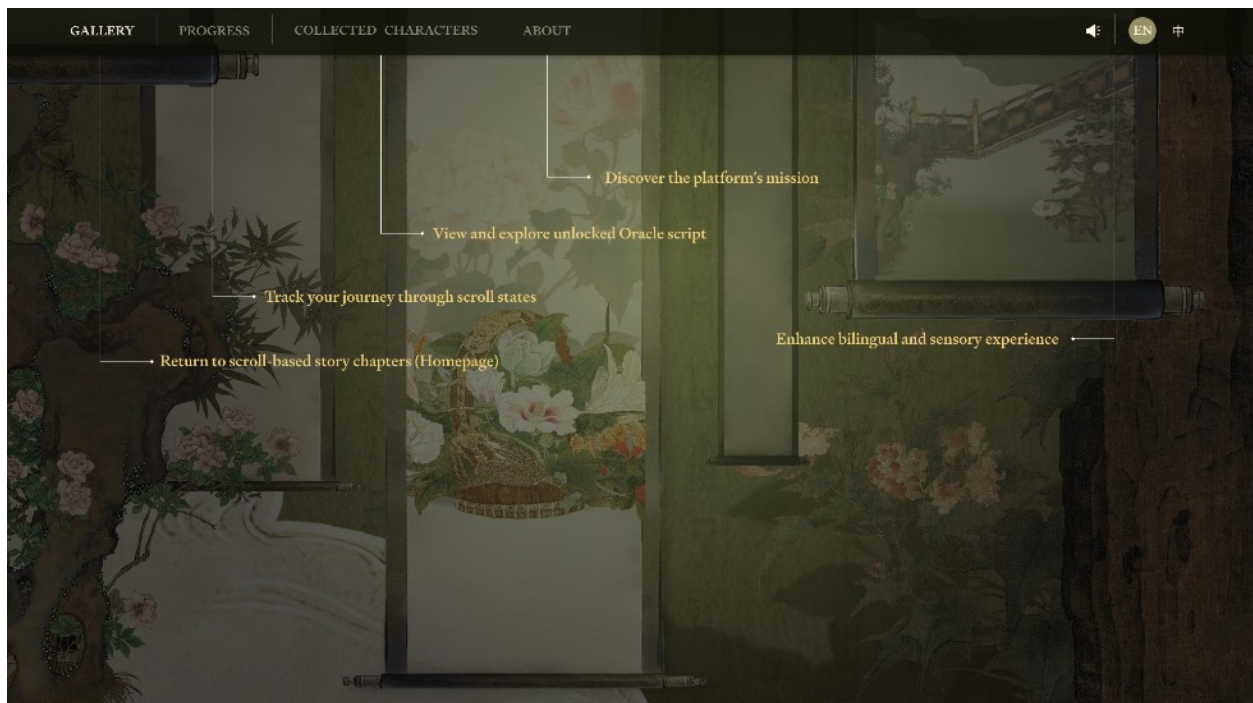
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Appendix

Oracle Uncoded Website UI

A.1 Homepage & Scroll Navigation

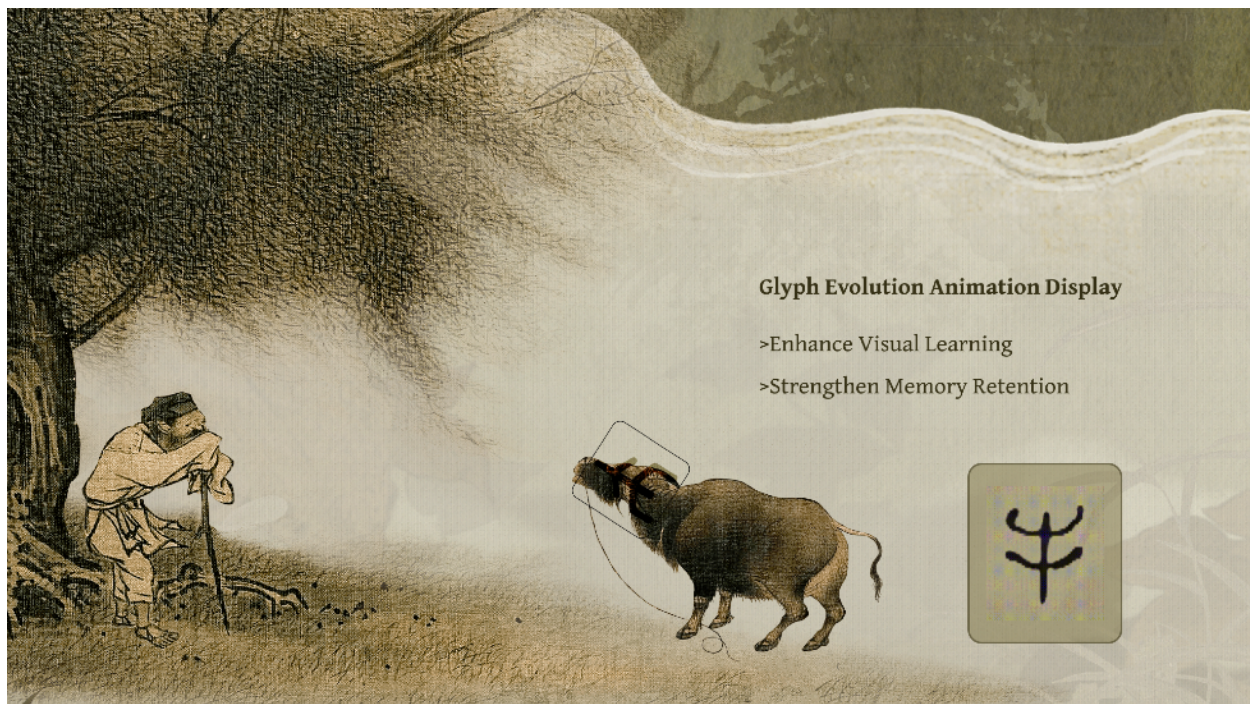
Screens showcasing the landing page with traditional scroll interface, hovering interaction, and navigation bar.



A.2 Story Chapter Interaction Screens

Visuals of interactive storytelling, including Oracle character triggers, audio interactions, and narrative scenes.











A.3 Character Collection and Evolution UI

Screens displaying collected characters, flip cards, and visual evolution from Oracle Bone Script to modern Chinese.

