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Historical Literacy in the Digital Age: The Role of Games in Cultural Education

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Master in Computer Science

Supervisor:
PhD Carlos Eduardo Dias Coutinho, Assistant Professor,
ISCTE - Instituto Universitário de Lisboa

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TECHNOLOGY
AND ARCHITECTURE

Department of Information Science and Technology

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To Inês, my family and my friends who believed in me when I could not.

For the late nights, the hard truths, the patient listening, and the courage to begin again.

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This dissertation carries your traces everywhere: in the steadiness that let me continue, in the clarity that shaped each chapter, and in the kindness that frames the whole. That is the best possible way.

Resumo

Este trabalho tem como objetivo analisar como a aprendizagem digital informal que ocorre com os jogos pode complementar e enriquecer a aprendizagem formal da história que ocorre numa sala de aula. A tese explora as possibilidades do design de videojogos com base histórica e culturalmente específica para aumentar o envolvimento, o conhecimento histórico e a memória cultural das gerações mais jovens de alunos. A investigação começa com uma base sólida de análise e integração do conhecimento existente sobre aprendizagem baseada em jogos, aprendizagem de história e património cultural. Com base nisso, o estudo propõe um conceito para um jogo histórico enorme e extenso, centrado em Viriato, um guerreiro responsável por causar dores de cabeça aos romanos na Península Ibérica.

O design propõe um jogo RPG de ação em mundo aberto que se passa em locais e momentos-chave do património de uma nação, onde o jogador reconstrói a história explorando, analisando trechos de fontes primárias e agindo como um historiador (obtendo informações, contextualizando-as com análises adicionais e, em seguida, verificando-as por meio de diálogos/pesquisas adicionais no jogo).

Um estudo de prova de conceito valida ainda mais a viabilidade do design do jogo e o seu valor educativo de forma a ver que uma versão em escala deste design de jogo seria possível e de forte valor educativo para a comunidade de pretendida.

Palavras-Chave: Aprendizagem Digital Informal; Aprendizagem Baseada em Jogos; Ensino de História; Património Cultural; Aprendizagem através da Jogabilidade.

Abstract

This work sets out to investigate how the informal digital learning that occurs through gameplay can complement and enrich the formal learning of history that takes place in a classroom setting. The dissertation explores the possibilities of historically informed and culturally specific video game design to enhance engagement, history knowledge, and cultural remembrance for younger generations of learners. Research begins with a strong foundation of analysis and integration of existing knowledge across game-based learning, history learning, and cultural heritage. On that groundwork, the study proposes a concept for a huge, sprawling historical game centred in Viriato, a warrior who was responsible for giving the Romans a headache in Iberia.

The design proposes an open-world action RPG game that takes place at and around key places and times of a nation's heritage, where the game player rebuilds history by exploring, analysing primary-source snippets, and acting like a historian (sourcing information, putting it into context with further analysis, and then verifying by further game dialogue/research). A proof-of-concept study further validates game design feasibility and educational value without necessarily doing full game development to see that a scaled version of this game design concept would be possible and of strong educational value for the intended learning community.

Keywords: Informal Digital Learning; Game-based Learning; History Education; Cultural Heritage; Learning through Gameplay.

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List of Acronyms

3D — Three-Dimensional (graphics, models, scenes).

AI — Artificial Intelligence (non-player character behaviours and interactions).

ARG — Alternate Reality Game (long-form, blended digital/real experiences used for learning).

AR — Augmented Reality (place-based overlays for cultural heritage and fieldwork).

ASD — Autism Spectrum Disorder (accessibility considerations in game/VR use).

DEER — Digital Escape Room(s) (structured puzzle sequences used as learning checkpoints).

DDR — Disaster Risk Reduction (education and preparedness practices aimed at reducing disaster impacts and vulnerability).

DSR — Design Science Research (artifact-centric research methodology used in this dissertation).

FOV — Field of View (The extent of the game world the enemy can see. Conceptually mirrors how the human eyes take in the world. Useful for player detection purposes)

GBL — Game-Based Learning (use of game systems to support learning objectives).

IGLS — Quiz/Interactive Game-based Learning Systems (quiz-style interactive game-based systems used for participation/recall).

MCQ — Multiple Choice Questions (used for proof-of-concept evaluation)

NPC — Non-Player Character (AI-driven characters that the player interacts with).

POC — Proof of Concept (Focused prototype built to validate core mechanics and feasibility of the proposed large-scale game before full production.)

PRISMA — Preferred Reporting Items for Systematic Reviews and Meta-Analyses (standards used to structure the SLR).

RPG — Role-Playing Game (genre for the large game concept and prototype slice).

SLR — Systematic Literature Review (method for identifying and synthesizing prior research).

SEN — Special Educational Needs (accessibility/accommodation considerations).

SO — Scriptable Object (Unity data asset used to store and reuse configuration data)

UI — User Interface (on-screen layout and interaction components, e.g., Codex three-pane).

API — Application Programming Interface (single unlock API for Codex entries).

VR — Virtual Reality (immersive reconstructions; provenance and trauma-aware framing).

CHAPTER 1

Introduction

1.1 Reimagining History Education for the Digital Generation

Historical study is not just crucial in developing a society's identity, roots, and collective memory but also in promoting informed citizenship, thinking critically about issues, and understanding today's events in a wider temporal context. Yet conventional methods of teaching history based primarily on rote memorization, texts in classroom settings, and lecturing fall short in today's increasingly technology-infused and speed-of-media-consumption environment.

Scholars have criticized these pedagogies in traditional contexts as hindering authentic historical knowledge and student engagement. Brenda M. Trofanenko, a professor of curriculum and instruction in the College of Education, argues that such pedagogies are "guaranteed to get students to tune out and add to our collective civic and historical cluelessness". Trofanenko also adds to this point by saying that “Everybody thinks of history as being really boring – and it is, if it’s solely the recitation and recalling of facts,” [1].

The coming of the digital age has altered the mindset of the younger generations in terms of information perception and interaction with content. They are now attracted to interactive media, social networks, and games to the neglect of passive learning methods. Consequently, history is not exactly an exciting and fascinating topic for the student of today living in an interactive world. But the very same interactive engagement presents an option: games that are generally regarded as merely recreative can be an inspiring instrument of learning. Game-based learning can be very useful in delivering factually based material in an engaging and interactive manner.

One example of this is that historical-themed text-based games do more than entertain; instead, De Vero and Bar assert that they engage players in decision-making situations that challenge critical analysis, ethical judgment, and historical reasoning skills. The authors' own research shows that students playing such games show enhanced source evaluation and interpretive skills because such games compel them to work through and interrogate historical dilemmas from multiple historical viewpoints [2]. In turn, Lai and Hu point out that spaces for game-based learning offer pedagogical benefits that extend beyond engagement alone. In the research conducted by these authors, setting learning material in computer simulations improved retention of fact alongside encouraging strategic thinking and instilling curiosity. Such immersive environments nudged learners to engage with historical events on deep levels of both emotion and intellect—involvements beyond those that could be achieved through traditional methods [3].

Along with content mastery, gaming drives the acquisition of transferable higher-order abilities. According to meta-analyses conducted serious games produce quantifiable differences in content

learning as well as higher order thinking skills, especially when tied to explicit learning objectives. The analysis in the research of these scholars indicated that learners instructed with game-based techniques tended to gain deeper knowledge and execute principles in new situations better compared to lecture-based instruction [4].

In addition, Darvasi [7] asserts that while games can't be an exact representation of historical reality, they provide "imperfect windows into the past." This metaphor resonates with the concept that games allow learners to live history in an interactive way—to make choices, observe the results of those choices, and analyse the restrictions of historical depiction.

In his case study of playing the game Total War: Rome II, Darvasi shows that learners immersed themselves deeply in Caesar's campaign in Gaul. Instead of hearing facts passively, learners took on roles of authority, handled logistics, negotiated with other leaders, made ethical choices within game scenarios, which resulted in a deeper grasp of military strategy, political nuance, and the human toll of conquest. Learners didn't learn merely what occurred but instead learned why it occurred, how it resulted in certain outcomes based on those choices, and how those choices affected larger outcomes. Darvasi observes that such interactive scenarios prompt students to raise fundamental historiographical questions—What is included? What is excluded? Whose story is it telling? —and thus engage in deeper awareness of the construction and contestation of historical narratives.

He goes on to point out that games open the door to emotionally resonant learning in which students do not just learn about events cognitively but experience the burden of decision-making, uncertainty, and moral complexity as well. By bringing simulation, strategy thinking, and narrative engagement together, games become potent arenas for developing historical empathy and critical thinking in ways that textbooks and lectures do not always make possible.

One of the most unique aspects of gaming in history education is the possibility of running 'what-if' scenarios. As Darvasi explains, “the fun lies in making choices, which often change the course of history. Video games can produce alternative histories—Caesar can lose to the Helvetii. Students can learn a lot from these “what if?” scenarios.”. The counterfactually based outcomes enable learners to test out different historical paths based on various variables and choices in decision-making. For instance, they can look at what might have happened if a military campaign was lost, if a treaty was never signed, or if a leader chose an alternate option in strategy.

Far from glossing over the past, these exercises challenge learners to engage with the complexity of historical causation, acknowledge contingency, and value the dialectic between agency and structure. In the process, games enable the development of a richer history as dynamic and interpretative rather than as set in stone events [5].

1.2 Motivation

Over the past years, historical studies as a field have been under a crisis of relevance for younger generations in general, and in Portugal in particular. Though crucial in defining civic identity and awareness and in developing critical thinking, today the subject is increasingly regarded as stagnant, out of reach, and unrelated to contemporary reality. Disillusionment is particularly evident in schoolrooms where history continues being widely taught through passive, conventional methods of lecture-restricted instruction, reading from texts, and memorization. As they are growing up in an age of increasingly interactive online experience, these methods tend to fall short in holding their interest or provoking deeper reflection.

Both quantitative and qualitative evidence underpin this impression of crisis. The *HistoMap* project reports that student performance on national history exams has been uniformly poor, with grades ranging from 9.0 to 11.0 out of 20.0 on average [6]. These results indicate not just a failure in content retention, but also an overall failure in developing historical thinking and conceptual comprehension. To support these findings, Moreira and Barca, discovered that student accounts of national history in writing tend to manifest in ethnocentrically over-simplified explanations devoid of evidential argument and context depth [7]. These trends point towards a generation increasingly detached from the historical narrative of the nation and incapable of responding in a critical manner due to its complexity.

At an academic level, the same is reflected in a perceptible drop in research in Ancient History in Portugal. As many as 17 PhD theses in Ancient History were completed in the country during 2010-2016. More disturbingly, only one is related to any aspect of Portuguese antiquity, more specifically the Sertorian War. All the rest were devoted overwhelmingly to conventional civilizations like Egypt, Rome, or Mesopotamia. Carneiro cautions that if these trends are maintained, ancient Portuguese history stands in peril of being "a complete desert in academic terms", as he succinctly states [8].

Yet these urgent needs also offer an opportunity. Scholarship on pedagogical innovation illustrates that technology-facilitated student-centred strategies can engage learners and enhance performance. Vieira and Ribeiro Flipped 8th-grade history lessons through a blended model involving videos, mobile-based timelines, Kahoot quizzes, and group e-books [9]. The approach greatly enhanced engagement and retention and enabled more classroom time for discussion and reinforcement. Likewise, Santos showed that gaming techniques involving “Liberal Bingo,” historical puzzles, and virtual quizzes not only engaged students but directly enhanced formal test performance. In her research, most students credited their success on tests to what they had acquired through gaming methods. Among 25 surveyed subjects, the near consensus was that games helped capture their interest more than traditional instruction and directly aided in learning [10].

Such results agree with the general tendency marked by Lagarto, who points out how "aula-oficina" or workshop classrooms based on active learner participation, inquiry, and interpretation consolidate active learning and engagement.

According to Lagarto, history teaching in Portugal has been moving forward towards more constructivist approaches, but has yet been exploited in mainstream teaching, particularly on underemphasized subjects such as ancient Portuguese history [11].

It is against this context of disengagement, academic disregard, and tested different models that the present investigation is situated. Like countless others, the author's interest in history was formed not just in the classroom, but through the video games encountered while growing up. Titles including *Age of Empires*, *Assassin's Creed*, *Sid Meier's Civilization* and *God of War* exposed historical eras, people, and societal systems that might otherwise remained unexplored. These games didn't supplant formal instruction but supplemented it. They offered an interactive source of immersion for passive acquisition of knowledge, while having fun and often initiated interest in unravelling historical events further.

As time has passed, this style of learning has been as memorable, if not more memorable, than what was learned in school. More recently released games like *Ghost of Tsushima* and *Kingdom Come: Deliverance* have polished off the historical immersion genre, but it was from these older games that curiosity sprouted: not in history in and of itself, but in the way it can effectively be conveyed through electronic media.

This dissertation represents the author's effort to recreate that experience—but in a context rooted in Portuguese heritage. Through developing a 3D action RPG based on the life and legacy of Viriato, the author wishes to make an accessible, compelling, and historically accurate experience that educates as it entertains. The intention is not to create an educational title for use in classrooms alone, but a commercially attractive title that opens wider audiences up to a vitally important and under-served chapter in Lusitanian history.

The hope is to see this investigation help make Portugal more visible within the international gaming community. Stories are worth sharing from Portugal and sharing them in a compelling format is building preservation and innovation for the country. Showcasing that learning doesn't have to be dull, unengaging, or limited to what has passed. It can be living, participatory, and significant if we are open to reimagining the way we share our narratives.

1.3 Project Idea

This dissertation meets a two-fold challenge—pedagogical and cultural—stemming from the state of history teaching and digital heritage in Portugal. On the one hand, history teaching still counts on overly passive, lecturer-focused approaches that cannot connect with a generation of students who are attuned to interaction and immersion. On the other hand, nationally important figures such as Viriato—the commander of the Lusitanian rebellion against Roman imperialism during the 2nd century BCE—lack representation on classroom narratives and wider cultural media, including video games.

Although the learning potential of interactive technologies, with a focus on gamified learning, has been widely confirmed [12], a historically informed, culturally representative video game engaging with Portugal's antiquity remains a void. A range of pedagogical and scholastic initiatives has indicated toward this deficiency. For instance, mobile history games are effective at raising students' engagement and retention [12], however, no such game, scholarly or commercial, has made an effort to examine Viriato's legacy, and indeed that of Lusitanian resistance, with a balance of historical fidelity, cultural relevance, and engaging gameplay.

This project introduces a fresh solution: a third-person, 3D action RPG based on the Roman conquest, the Roman provinces of the Iberian Peninsula, while also focusing on the Lusitanian rebellion. Instead of putting into play a recreation of Viriato, using a fictional companion's point of view, the story is told avoiding conjectural reconstruction of speech and sense of thought, yet allowing for narrative freedom, historicity, and affective engagement. The player sees and acts upon important events, creating their own history, interacting with people, places, and political forces based on history.

Game mechanics combine classic RPG mechanics—skill advancement, moral dilemmas, fighting, and choice-driven dialogue—with learning mechanics derived from archaeological, historical, and textual evidence. By using such a format, gamers experience Lusitanian society, pre-Roman Iberia's geography, and Roman rule's complicated socio-political fabric. The structure is educational by design, yet free from pedagogic confines, aiming for broad audiences and marrying commercial appeal with pedagogy.

This strategy is reminiscent of conceptual games such as *The Fifth Empire* [13], which attempted to represent Portuguese identity through mythologized gameplay. This project is differentiated, however, by its attention toward historical specificity and technological aspirations. The ambition is neither to universalize national identity, but to locate it within a retrievable, research-driven narrative of resistance, leadership, and survival.

Globally, the project is informed by Assassin’s Creed franchise, Kingdom Come: Deliverance, and Ghost of Tsushima—games which showed that historically informed games could be successful commercially and which had also fostered historical literacy. The Assassin's Creed franchise has

particularly delved into a range of time frames, from Renaissance Italy through Ancient Egypt and Revolutionary-era America, demonstrating the capabilities of interactive design to present intricate historical narratives in a gripping and engaging format. This project would seek to provide special focus on Lusitanian traditions, Roman encounters, and Viriato's fractured yet influential legacy.

National examples, including *Portugal 1111: A Conquista de Soure* [14] and *Thralled [15]*, demonstrate an initial endeavour to present Portuguese history within digital media. *Portugal 1111*, with a medieval thematic focus, is however restricted on modern aspects of game design, whereas *Thralled* is more aesthetically focused than interactive. Conversely, the suggested game intends an integration of the narrative depth of modern RPGs with the cultural objective of games based on heritage, creating a hybrid model which is engaging and informative.

Furthermore, Peixoto in *Jogar com a História*, points out that games are capable of influencing an account of historical causality and temporality, teaching students and gamers a chance at internalizing historical dynamics through effective decision-making [16]. That is what this project is about: making history less about that which we learn and more about that which we live.

Overall, what is presented is an innovative addition at the crossroads of game development, pedagogy, and cultural conservation. The game does not teach history, strictly speaking, rather, it invites you into it, making you experience it, and, upon exit, leave with a better sense of a formational yet overlooked chapter of Portuguese identity. It is simultaneously an unprecedented act of digital conservation of history and an enlightened paradigm for conveying history in the 21st century.

1.4 Methodological Overview

Considering the aims of this dissertation—to envision an educationally informed, culturally relevant interactive experience based on a historical figure from Portuguese antiquity—the methodology needs to take a form that is strong enough to serve simultaneously for creating a new digital artifact and engaging critically with current academic literature. For this, an integrated methodology has been chosen, blending Design Science Research (DSR) with a Systematic Literature Review (SLR).

Design Science Research (DSR) is especially suited for instances when a goal is to design and analyse an innovative artifact, for example, conceptualizing a video game based on history. DSR is a problem-solving approach based on defining a real-world problem, formulating a solution, and reflecting on its value and relevance. In this dissertation, DSR facilitates structured development of a concept for a game that addresses pedagogical disengagement and cultural invisibility of Portuguese historical content within digital media.

As there is no inherent methodology for literature review within DSR, it is supported by a Systematic Literature Review (SLR). The SLR is an open and reproducible process for finding, selecting,

and integrating appropriate scholarly resources. SLR is applied within this project for investigating prominent thematic areas including game-based learning for history education, national identity representation within video games, and usage (or lack thereof) of Portuguese history for education and entertainment purposes. This synergy makes it possible for the project to be theoretically grounded and practice-oriented at the same time, which assists with the creation of an artifact that is responding to an actual need and yet based on available scholarly works. In Chapter 3, a detailed explanation of applying DSR with SLR within this dissertation will be provided.

1.5 Research Questions

Research Questions are a critical tool of the research process, and act as compass dials, charting for the author his path through this research and assisting him toward realizing objectives set out for this project. They are meant to steer not only literature survey and conceptual investigation but also assess whether suggested solution—a historically informed, culturally relevant video game based on the icon of Viriato—appropriately solves pedagogical and cultural hurdles recognized in previous sections.

Considering the cross-field character of the project, which combines historical education, cultural conservation, and computer game design, Research Questions were designed with an open, reflective, and non-binary form. They do not require straightforward “yes” or “no” answers, and are designed, on the contrary, for inquiry, analysis, and critical synthesis.

The research questions listed below organize the formulation, rationale, and assessment of the project:

RQ1

How can historically themed video games contribute to the engagement and historical awareness of younger generations?

RQ2

What role can culturally localized video games play in preserving and revitalizing national historical memory in the digital age?

Together, such questions guarantee that the dissertation has a focused direction while still leaving room for creative expression and critical analysis. They provide the basis for the literature review and for the methodology of design introduced throughout the subsequent chapters.

1.6 Hypotheses Definition

The definition of the Research Questions directly results in drafting a collection of linked Hypotheses intended to give a scientific answer to their respective Research Questions:

RQ1

How can historically themed video games contribute to the engagement and historical awareness of younger generations in Portugal?

RQ1_H1: Students are more engaged with a country's history when they are taught using historically themed video games compared to through conventional teaching.

RQ1_H2: Narrative-focused gameplay makes players more aware of history by enabling players to emotionally and cognitively engage with historical events and individuals.

RQ2

What role can culturally localized video games play in preserving and revitalizing national historical memory in the digital age?

RQ2_H1: Culturally localized video games are useful means of saving neglected historical accounts through situating them in interactive virtual experiences.

RQ2_H2: Players retain greater historical knowledge when they learn about culturally familiar narratives in their own country.

The goal of the ensuing dissertation will thus be to validate such Hypotheses and thereby answer the Research Questions and legitimize the design and cultural applicability of the suggested digital product. The Hypotheses are to be tested using a blend of conceptual evaluation, argumentation aided by literature, and resultant reflection against educational and cultural research.

1.7 Contributions

This dissertation draws on the expanding body of knowledge that validates game-based learning as a legitimate pedagogical method and a substantive means of engaging with cultures. Against the backdrop of fading interest and poor retention rates of students—most often in the context of conventional classrooms—this project makes the case for a more interactive, dynamic model of learning based on digital media. Though a conceptual artifact of particular focus is a video game of Viriato and the Lusitanian resistance, the larger aim is to investigate how these tools can support system-wide changes in education, rekindle involvement on the part of students, and foster learning through doing instead of receptivity.

Its impacts can be classified into four converging areas: pedagogical innovation, digital cultural engagement, applied design methodology, and education strategy that extends to areas outside the humanities.

1.7.1 Pedagogical Innovation

This dissertation makes the case for a transformation of society's conception of teaching and learning away from fixed, content-dense delivery models to formats that emphasize active engagement, choice-making, and affective engagement. More generally, it contributes:

- An argument in support of employing digital games to promote motivation, retention, and critical thinking among students.
- Evidence that supports the notion of interactive, student-centred learning environments that can enhance and, in certain cases, surpass conventional modes of teaching.
- A framework by which to design instructional material that could be applied similarly in a range of subjects, not just in history but also in fields like language acquisition, ethics, civic education, and even environmental studies—where context, narrative, and inquiry are central to understanding.

Using the Viriato game as a case example, showcases how narrative structure, agency, and roleplaying can contribute to the creation of rich learning experiences that tap into students' pre-existing digital habits.

1.7.2 Digital Media for Cultural and Educational Relevance

Outside of the classroom, the study has relevance to debates regarding the ways that education intersects with cultural identity and media consumption. Given that today's students are heavily embedded in interactive, visual media, the dissertation addresses:

- Educational material can be infused into culturally appropriate narratives to enhance personal and national identity.
- Games' ability to act as platforms to reintroduce lesser-known history, ethical, or social narratives in a way that makes them accessible.
- How games can serve as dynamic learning environments in which students are able to interact with material in a way that mirrors the richness of real-world decision-making, context, and causality.

The project emphasizes the benefits of providing meaningful points of view--such as seeing Viriato through the lens of a hypothetical friend without compromising scholarly or historical rigor.

1.7.3 Applied Methodological and Design Contributions

Methodologically, the project also exemplifies how digital work can be made creative yet underpinned by robust academic frameworks. The blending of Design Science Research (DSR) and Systematic Literature Review (SLR) provides:

- A systematic but adaptable model of education game design.
- A structure used to critically evaluate the relevance, feasibility, and fidelity of conceptual models.
- A case of how to develop solid academic digital learning materials.

Viriato case study is a proof-of-concept that could be applied to various subjects or fields by other scholars, teachers, or designers.

1.7.4 Extending Educational Strategy Beyond Content Transmission

In conclusion, this study contributes to a larger discussion of the way education must continue to adjust to stay effective and pertinent. It supports the notion that

- Tools such as videogames are not distracting from learning, but alternative models of learning that draw upon how students are already accustomed to and comfortable processing information and narrative.
- The incorporation of storytelling and interactivity into learning enables deeper, intuitive learning.

- Projects like this one can impact curriculum planning, museum education, public history, and corporate training, wherever conventional formats have fallen short in maintaining interest.

Although based on a narrative of history, the pedagogical principles underlying this work—engagement through interactive strategies, meaning making through story, and learning through experience are adaptable to a range of disciplines and learning contexts.

1.8 Document Map

This dissertation consists of six chapters that collectively form the development and articulation of the proposed research:

- **Chapter 1** sets out the theme, motivation, and context of the research. It defines the central problem that is to be addressed—namely, the declining interest in education (in particular in history) across younger generations—and outlines the overall project aim of considering game-based learning as a potential solution.
- **Chapter 2** provides a Literature Review of the central themes that underline the research here presented, including real games, game-based learning pedagogies, digital heritage, and application of video games within education.
- **Chapter 3** presents the Methodological Framework used in the project. It explains the application of Design Science Research (DSR) and Systematic Literature Review (SLR), and how they complement the design and evaluation of the solution proposed.
- **Chapter 4** describes the conceptual design of the proposed solution: a 3D role-playing game that presents the Viriato narrative as a case study in the larger aim of enhancing education engagement.
- **Chapter 5** outlines a proof-of-concept of the game design referenced in chapter 4.
- **Chapter 6** presents the findings and implications of the project and wraps up the dissertation by presenting the major conclusions and making recommendations on future studies, development, and instructional integration.

CHAPTER 2

Literature Review

2.1 Purpose and Scope

This chapter integrates research on game-based learning (GBL) and serious games pertinent to history teaching and related civic-cultural objectives. It raises a practical issue for design of the curriculum problem: How do games offer themselves to be integrated so as to foster historical thinking—sourcing, contextualization, corroboration, construction of narrative, empathies—without being remiss about disciplinary rigor?

The review covers meta-analytic evidence, classroom interventions, and studies on the design/deployment across various settings, including the Portuguese context, as also on immersive/locative media. Foregrounds among the positions are the criticism of instruction based on memorization-centricity and the alternative proposal that games place students under interpretive uncertainty—the normal situation of the historian [1].

2.2 Debates, Tensions, and Effects Explained:

A 15-year literature review converges on the finding that strengths in engagement and conceptual understanding are offset by challenges—teacher unfamiliarity, poor lesson fit, shortage of resources and measures [3]. Concurrent research in higher education reveals GBL raises enjoyment and deep learning (particular among high-anxiety topics), although surface-recall gains are inconsistent unless a tight alignment between mechanics and learning outcomes is present [17].

More generally, GBL research on interactivity points up that active, feedback-rich experiences assist goal-directed learning more than passive exposure, provided task-planning is adequately scaffolded [18].

The fact vs. interpretation debate is core to history. Trofanenko's critique cautions that stress on memorizing detached facts erodes historical and civic comprehension; the antidote is causal inquiry, significance, continuity, and contentious narratives [1]. Commercial off-the-shelf and custom games make this inquiry concrete by foregrounding ambiguity: non-violent, muse-mode titles such as Discovery Tour: Ancient Egypt by Assassin's Creed Origins present vetted encyclopaedic material but need teacher facilitation to raise conjecture and historiographic constraints [5]. Text-based titles like Evenir Case Files teach source criticism under time constraint explicitly, with students considering bias and provenance just as historians do— promising but in need of longitudinal confirmation [2].

Two other tensions recur. Fun vs authenticity: fictionalized or skewed narratives mislead if badly framed; the analysis of French Revolution games reveals how linear didactic timelines (e.g., *Tríade*) contrast with multilayered, presentist temporalities in commercial titles (*Assassin's Creed Unity*), each

with distinct pedagogic affordances when explicitly mediated [16]. Agency vs guidance: open worlds allow experimentation, but inquiry prompts as well as debriefs are required; linear designs ease causality but risk oversimplification.

2.3 Classroom Models That Work

Teacher-facilitated commercial play. In low-infrastructure situations, edited extracts from strategy games can frame content and abilities without a one-device-per-pupil. Teachers framed historical description and analysis through short gameplay clips, including discussion and conventional activities—a practical model that increases motivation while retaining disciplinary structure [19].

Blended and flipped history. Portuguese adoptions that blend pre-class resources, in-class collaboration (timelines, group tests), and light gamification (Kahoot, Book Creator) report positive outcomes, but these gains are conditional: students must come prepared and have reliable access to devices, and teachers must provide clear task sequencing, expectations, and scaffolding so that motivation translates into high-quality work [9]. Online, competitive quiz systems that include collaboration capabilities can particularly benefit the lower achievers in history by increasing participation and time-on-task [20].

Embedded assessment during narrative play. Alternate Reality Games such as *Plunkett's Pages* integrate assessment as part of progress: historically based puzzles and coded websites gate progress and produce rightful evidence of knowledge and reasoning [21]. Similarly, properly designed digital escape rooms based on Bloom's taxonomy enhance knowledge, collaboration, and motivation among primary-level Byzantine history [22].

Text and counterfactual research. Text adventures that require judgments about evidence build both toolsets (judging evidence) and habits (updating beliefs) that are common to taking stock as "thinking historically," although initial research is small-N and short-term [2]. Commercial myth-history such as *The Fifth Empire* can prompt ethical consideration and identity work if instructors uncover allegory, speculation, and historiographic stakes [13].

Minecraft as a participatory lab. Science and disaster education applications of Minecraft demonstrations indicate strong audience engagement, but acquisition of science depends on sequenced activities (scaffolding, reflection, debriefing) as well as explicit connections to real-world

hazards and evidence [23]. Sandbox play becomes disciplinary if activities aim at sources, claims, and refutations.

Immersion and place. Virtual reality (VR) reconstructions (*VESPACE*) enable researchers and citizens, to live in past locales while questioning sources within the world itself through interfaces such as *PROUVÉ*; the very embodiment that strengthens comprehension can also solidify speculations, so provenance needs to be visible [24]. Location-based AR games associate folklore, monuments, with quests, compelling heritage, touristry, local business (e.g., *Aveiro's AVARUM Lands*) but this often shifts narrative authority toward the game's story logic rather than historical accuracy [25]. Evidence from media-comparison studies in climate instruction also cautions against assuming immersion automatically improves achievement: desktop, VR, and text formats can produce similar factual learning outcomes, meaning that debriefing, worksheets, and guided reflection remain essential [26]. Context-aware AR authoring platforms (Science Spots AR) demonstrate viability, motivation gains, as also the need for UI improvements and teacher support [27].

Specialized and professional learning. Accessible, affordable VR with motion tracking supports attention as well as motor-skills practice appropriate for children with autism spectrum disorder (ASD), indicating differentiated learning pathways [28]. Nautical English practice through a web GBL platform aligns to standards and reveals high learner motivation [29]. AI/metaverse quiz systems used in the demonstration of healthcare practice indicate flexible, genuine practice under high user satisfaction [30]. Serious games that use motion capture hold the potential to conserve intangible cultural heritage, as the example of Cantonese opera practice used here [31]. Card-game interventions intervene for novice misconceptions about computer literacy among non-computer-science majors, demonstrating the possibility to address domain-specific misconceptions provided through playful designs [32].

Personalization and appropriation. Profiling learners to match them to games as well as using game ontologies to do so could raise motivation as well as outcomes in computational thinking—a tactic awaiting legitimation to history courses with heterogeneous learners [33].

2.4 Civics, Media Literacy, and Public History Beyond the Classroom

Exploratory survey research links strategy-game playing with strong political interest and activity, indicating games have the potential for cultivating efficiency for democratic engagement with exposure to learning contexts [34].

Misinformation-game reviews demonstrate that simulation and investigation mechanisms develop algorithmic and source-evaluation aptitude; short, platform-friendly titles facilitate school use [35]. Wartime games from Ukraine build visual histories of resistance and civic identity and serve as cultural communications for domestic and international publics [36].

In China, commercial games on history act as public-history participation tools and facilitate counterfactual thinking and democratization of interpretation; historian engagement can add depth and nuance for critical engagement [37]. Museum-based design can translate transitional-justice objectives across media with the aid of ethical co-design [38].

2.5 Portugal in Focus: Stories, Curriculum, and Capacity

National studies of Portuguese students' national narratives identify heroic, mythic framings in the younger groups especially around key episodes: the founding of Portugal, the Age of Discoveries, the Salazar dictatorship, and the 1974 Revolution. Multiperspectivity increases with age but remains limited suggesting a need for empathy-rich, evidence-based instruction [7].

Over the last 25 years, policy has swung between content-rich and competency-based curricula; aula-oficina workshops stress sources, inference, and metacognition but experience time demands and implementation limitations [11].

In higher education, Ancient History PhD output (2010–2018) is modest and orthodox, with minimal innovation in methodology and concentration in multiple centres—indicating demands for investment and interdisciplinarity [8]. On the middle-years side, the 1910 mobile game connects national history with fun-filled problem-solving, with teacher control-dashboards for tracking and recap for mastery; design consistency with student genre preference underpins motivation [12].

2.6 Implementation Principles

1) Define disciplinary aims. Align game activity with sourcing, contextualization, corroboration, narrative construction, empathy, and ethical argumentation—not simply memorization.

2) Select mechanics that implement procedures. Favor inquiry, role-play, and argument mechanics for history; apply non-violent "museum modes" for exploring culture and daily life [5].

3) Structure the leaning trajectory. Begin with pre-play stimulation and question formulation, continue with in-play prompts and evidence books, and conclude with post-play debriefs using primary and secondary sources plus reflective journaling. Use embedded challenges (escape rooms/ alternate reality game (ARG) puzzles) as formative assessments [22].

4) Support Teachers. Give exemplars, co-planning time, micro-credentials, and tech-light pathways (projected clips with commentary) for low-resource schools [19].

5) Accommodate equity. Provide cooperative ways and nontraditional routes for students with limited access or varying motivational dispositions; engineer for accessibility and differentiated challenge [20].

6) Be mindful of infrastructure and discretion. Start with small pilots, set clear routines, and use feedback cycles to refine before scaling. Plan for device availability, bandwidth and offline contingencies, logins/permissions, and the teacher's ability to monitor progress without losing instructional time. Establish basic data-protection practices (minimal data collection, anonymised accounts where possible, and consent/age-appropriate use) and ensure activities fit school policies and safeguarding requirements.

7) Position games as complements, rather than school-work substitutes. The evidence reveals that anxiety can decrease, and motivation can increase (e.g., mathematics), but performance on test papers might not necessarily follow; pair quizzes with performance tasks and rubrics [39].

8) Customize as possible. Characterize learners and match titles to needs and style for improved fit and persistence [33].

2.7 Assessment: From Engagement to Evidence

Despite popular myths surrounding engagement, assessment is still the stumbling block for enduring use. Borrowing from ARGs, escape rooms, and flipped-classroom applications, this section delineates functional designs for assessing disciplinary results.

2.7.1 Evidence for historical thinking

- **Sourcing & provenance**: Students determine author, audience, purpose, and context for in-game texts, artefacts, or NPC testimony; scoring rubrics separate description from evaluation [2].
- **Corroboration**: The players link up conflicting testaments (example, temple inscriptions and merchant diaries in Egyptian tours and so on) and support verdicts with various evidence each [5][16].

- **Contextualization**: Pupils place happenings within economic, political, and cultural frameworks (such as Spartan decision-making role-playing assigning geography, institutions, and economy) [5].
- **Narrative construction**: Students compose short evidence-drenched narratives recounting change/continuity; teachers score claim-evidence-reasoning. [5]

2.7.2 A Sample Analytic Rubric (Summary)

Dimensions: Clarity of claim; Relevance/quantity of evidence; Source criticalness; Confirmation; Contextualization; Multiperspectivity; Moral consideration.

Levels: Emerging, Developing, Proficient and Advanced.

Use: Insert as checkpoint assignments within ARG/Digital Escape Rooms (DEER) or post-play seminar questions [21].

2.7.3 Patterns of assessing which maintain flow

- **Gate puzzles** (ARG/DEER): Advance only with corroborated/source validation [21].
- **Field notebooks**: In-game notebooks that automatically collect quotes and screenshot images; students mark bias and context [5].
- **Debriefs structured**: 10–15-minute Socratic discussions with pre-authored prompts aimed at misconceptions (e.g., “What in the game is conjectural? How do we know?”) [9].

2.8 Equity, Inclusion, and Access

Access and infrastructure

Use tech-light modes (projected clips; teacher-controlled demos; analogue card mechanisms) where devices are minimal, as proven effective in Southern African classrooms [19]. Prepare offline fall-back, download videos or clips in advance, print key screenshots/maps and source packets, and keep paper versions of prompts, evidence logs, and rubrics so the lesson can run without Wi-Fi. Have a Plan B sequence ready (mini-lecture + source analysis + quick-write) that preserves the same learning aims if the platform fails. Pair these contingencies with pair-work rotations, so students alternate between a short device station and low-tech stations (document analysis, timeline construction, debate prep) while the teacher checks progress.

Motivation diversity

Competitive test modes like Kahoot and interactive game-based learning systems (IGLS) energize many but alienate some; combine with collaborative puzzles and thinking tasks [10][20]. Customize game selection, when possible, for maximum persistence [33].

Universal design & SEN

For ASD or sensitivity to senses, set session time limits, provide controller options, and allow quiet debrief areas; VR studies demonstrate possibility with motion-tracking and meticulous task development [28].

2.9 Methodological Notes and Ethical Considerations

Constraints in the evidence base

Several studies have short samples, short time frame, or self-report measures, which pose risks for novelty and expectancy effects [23][2]. Meta-analytic heterogeneity bears witness to divergent design and comparison groups; future research would do well to pre-register and report fidelity measures [4].

Ethic and epistemological concerns

Presentism & illusion of certainty. Immersive media (VR/AR; photorealistic worlds) can render conjectural reconstructions seem definitive. Mitigations: seeable provenance layers (e.g., PROUVÉ-style annotations), clear labels for speculative assets, and regular debrief prompts ("What in this scene is uncertain, and why?") [[24][5].

Bias and framing of narratives. Commercial titles can favour mainstream or national discourses (e.g., frames of heroes, war binaries), silencing subaltern voices. Teachers can counter-source against each other, encourage multiperspectivity, and incorporate ethical thinking activities on what is left out and whom [36][37][7].

Representation of violence and problematic histories. War, empire, slavery, genocide, or repressive content demands age-appropriate framing and trauma-sensitive practice (content warnings, opt-outs, alternative activities). Favour non-violent museum modes when objectives are cultural learning rather than warfare competency [5].

Data protection and services. Games and companion services online may collect personal information. Schools must review Terms of Service, turn off tracking functions where possible, and refrain from

student accounts unnecessarily; opt for on-prem or offline deployments for minors. Request parental/guardian permission where they must do so. [5]

Fairness and accessibility in assessing. Be careful not to mix controller proficiency or reading speed with disciplinary thinking. Include input alternatives, time concessions, and printable copies of in-game writings; grade with analytic rubrics that aim at sourcing/corroboration, not agility [9][20].

Intellectual property and cultural heritage. Use excerpts and screenshots within fair-use/quotation confines for instruction, credit creators. For cultural assets for heritage (monuments, artefacts, music), be respectful of reuse licenses and refrain from decontextualization that warps meaning, particularly for colonized or Indigenous cultures. [5]

Teacher role ethics. Be transparent: explain to students where the game distorts reality for gameplay; demonstrate epistemic humility and revelation of uncertainty. Avoid “gotcha” puzzles that sanction without educative value; make challenge facilitate rather than gatekeep learning. [5]

Psychosocial well-being. Counterbalance competition with cooperation in order to decrease anxiety; be vigilant for motion sickness or sensory overload in VR; set a maximum on session time and provide other routes in existence—particularly for SEN students [28].

2.10 Synthesis, Conclusions, and Historical Thinking × Game Mechanics Map

This chapter has explored how games—commercial blockbusters, custom-built educative titles, analogue media, AR/VR reconstructions, quizzes, and ARGs/DEERs—can move history as an interpretive discipline beyond a list of facts. The literature demonstrates, as a result, that skilfully choreographed game experiences transfer engagement as disciplinary evidence when the teacher positions play as inquiry and evaluates the moves of the students (sourcing, corroboration, contextualization, multiperspectivity, argumentation, ethical consideration). Engagement is not enough; instruction and alignment determine impact [4][3].

Where the evidence comes together (and where it doesn't)

Learning and retention. Meta-analytic findings demonstrate modest-to-moderate gains for serious games on immediate learning and retention (with larger effects when used with supplemental instruction and multiple sessions), while motivational effects, although positive, are not consistently significant [4]. Major higher-education implementations follow the same model: fun and learning increase, but surface recall fluctuates with design-result matching [17]. In K–12 environments, online systems incorporating competition and co-op can increase participation and favour weak achievers, if assignments test reasoning and not speed [20].

Teacher moderation and infrastructure. Context is everything. In low-resource settings, teacher-selected clips from commercial strategy games (e.g., Napoleon: Total War) maintain rich causal talk without one-to-one devices [19]. Flipped-classroom histories that match teacher videos with in-class collaborative learning and low gamification (Kahoot, Book Creator) have promise if preparation and access are good; otherwise, engagement bursts apart [9][10]. Case studies of Minecraft in science and disaster risk reduction (DRR) reaffirm that structured sequences (scaffold followed by act and then reflect) are the lever, not the sandbox per se [23].

Assessment alignment. Games that integrate gates related to disciplinary thinking (ARGs; DEERs) naturally accumulate valid evidence of sourcing/corroboration with ongoing flow and overcoming a primary obstacle to sustainable GBL [21]. Narrative assignments graded with analytic rubrics translate gameplay into assessable explanation and writing.

Equity and inclusion. Repeatedly, research demonstrates that games can alleviate anxiety and encourage participation (e.g., Moroccan elementary mathematics), but performance leads on games does not necessarily transfer on-paper; games must supplement, not supplant, assessment [39].

Rotation of roles, off-line analogues of in-game texts, and user-friendly controls so that dexterity and accessibility of devices does not disguise as historical thinking [10][20]. Pilots for special-education applications illustrate viability of motion-tracked VR as an attention-holding therapy-adjacent tool where sessions are short and alternatives are possible [28].

Portuguese lenses. Studies of student narratives reveals early over-reliance on heroic, mythic templates with little multiperspectivity; older students demonstrate greater sophistication but nevertheless need support for empathy and critique [7]. System-level inspections trace fluctuation between content-dense and competency-focused curricula; workshop ("aula-oficina") design fits naturally with game-mediated inquiry but experiences time and implementation demands [11].
National designs, such as the 1910 online game, demonstrate that national history can be presented as episodic problem-solving with teacher dashboards and rewind for mastery [12]. At the same time, Ancient History PhD capability continues thin and conventional, indicating a strategic opportunity for alignment between public-facing game worlds and academic innovation [8].

Ethical and epistemic guardrails

Presentism and illusions of certainty. Photorealistic VR reconstructions can make guesswork seem fact; classroom instructors must bring out provenance (scan vs. artist's interpolate) and mark uncertainty explicitly [24]. Discovery-mode games must come with questions that seek what is known, inferred, or disputed [5].

Narrative bias and cultural politics. War games from Ukraine enlist defence/invasion binaries and symbols; historical games from China function as public participatory history that intermixes history and fiction for the purposes of exploring contingency; both demonstrate the ways that games build identities and memories that need classroom counter sourcing and multiperspectivity [36][37]. Portuguese student-narrative responses support this necessity for conscious contrastive sources [7].

Careful histories, traumatic-conscious instruction. For empire, slavery, dictatorship, or genocide, use museum-mode or text-question kinds when the aim is cultural comprehension; use content warnings, opt-outs, and alternative tasks. Steer clear of rewarding transgressive play that trivializes harm [5].

Data protection, IP, and heritage. Online platforms (quiz websites, IGLS) can gather details; schools must review terms, turn off tracking, or use offline installation when feasible [20]. Heritage games (reconstructors, AR tours) have to abide by licenses and refrain from decontextualizing colonized or Indigenous artefacts [25].

Accessibility and fairness. Grade reactions, not instincts. Give input alternatives, additional time, and printable copies of in-game texts; set rubrics on historian moves; double-mark samples for reliability increase [9][21].

Professional ethos. Teachers will need to exemplify epistemic humility, announce design freedoms, and refrain from "gotcha" puzzles that gatekeep instead of instructing [3].

2.11 The Historical Thinking × Game Mechanics Map

The best through-line in this literature is that mechanics matter. Designs that incorporate historian practices produce superior evidence of learning compared with designs that simply pose historical scenes.

- **Sourcing & provenance**: Codices, unlockable dossiers, gates for interviews.
  Students: determine the author, audience, purpose, and context.
  Mechanics: in-game encyclopaedias and codex entries that can be unlocked by questioning NPCs or finding inscriptions; fog-of-war clearing upon sourcing actions.
  Exemplars: Discovery Tour (with teacher prompts) [5]; text-adventure dossiers [2].

- **Corroboration**: Set-piece quests, contradiction puzzles, credibility meters.
  Students: compare sources; defend making decisions.
  Mechanics: quests that need heterogenous evidence; head-to-head source rivalries settled through expressed criteria (proximity, motive, expertise).
  Exemplars: DEER gates; ARG gates that need a rationale to open [22][21].

- **Contextualization:** Layered maps, timelines, resource systems.
  Students: place things in contexts (economies, institutions, geography).
  Mechanics: map layers (trade, taxation, logistics), interactive timelines, resource limitations highlighting structures prominent.
  Exemplars: teacher-facilitated strategy-game clips [19]; climate-change media comparison reminds us that immersion ≠ certain knowledge gains without debrief [26].

- **Multiperspectivity & empathies**: Asymmetry of role, perspective shifting, branching conversations.
  Students: integrate conflicting perspectives morally.

Mechanics: asymmetric role cards; playing episodes as elite/non-elite or colonizer/colonized; discussions that bring up trade-offs and costs.

Exemplars: public-history studies (Ukraine/China); classroom narrative activity by patterns of Portuguese heroization [36][37][7].

- **Argumentation (claim–evidence–reasoning)**: Evidence slots, justification prompts, craft-a-claim challenges.

  Students: make supported claims.

  Mechanics: Ask for the placing of evidence tokens and the picking/writing of a defence; automatic screenshotting/quoting into notebooks for referencing.

  Exemplars: end-unit stories in Ancient Egypt template; rubric-related writing assignments [5].

- **Ethical consideration & doubt**: Guessing alarms, doubt meters, provenance layers.

  Students: respect for limitations and rules of representation.

  Mechanics: on-screen guess flags; overconfidence-penalizing uncertainty meters; overlays distinguishing scan-grounded geometry from fill-artistic geometry.

  Exemplars: VESPACE with PROUVÉ commenting; AR cultural tours that identify speculative reconstructions [24][25].

- **Transfer to civics/media literacy**: Looped investigations, prompts for algorithm, short classes.

  Students: question sources and systems

  Mechanics: simulation/min-game investigation with debrief on responsibility and algorithm and short, platform-non-specific designs facilitate e-adoption [35].

2.12 Media, modes, and constraints: what to use when

Early in Museum-style explorations (e.g., Discovery Tour) transfer best for culture and daily life, which they pair nicely with primary-source packets and journal writing [5].

DEERs shine as constructive milestones; they also scale rapidly and organize assessment [22]. ARGs are robust for long-form study and co-creation but need coordination and explicit ethics [21]. AR cultural games (e.g., AVARUM Lands) link place and culture and commerce; great for fieldwork and public engagement with sensitive licence and context [25]. VR reconstructions (VESPACE) are persuasive for embodied comprehension and academic annotation; handle with stringent provenance and trauma-sensitive framing [24]. Quiz/IGLS systems facilitate participation and recall but need to be linked with argument assignments lest they amount to thin victories [20]. Professional/arts training

games (Polimarlish.id; Cantonese opera; medical device ID) illustrate by example the expansive pedagogical affordance of feedback-rich practice and can also spawn history-skills drills (argument structuring, sourcing quick-checks) [29][31][30].

2.13 Inferences for program design (Portugal and beyond)

A tech-light, high-alignment model is plausible in limited schools: edited strategy-game clips followed by Discovery Tour with evidence books; single DEER checkpoint and a short narrative marked with the analytic rubric. This progression meets Portugal's recorded needs (multiperspectivity, contextualization) and within limited time [11]. For districts investing in place-based learning, AR heritage overlays (like in Aveiro) can take desk-based inquiry out into civic space [25].

At university, correlating student interest from commercial games with research seminars can reinvent Ancient History by highlighting historiography and methods [8].

2.14 Limitations and future directions

The field must have longitudinal designs tracking transfer on new subjects and civic thinking; rigorous reporting on fidelity and context; and proven in-game analytics that track sourcing/corroboration without disrupting flow [4]. Comparative studies must continue to inquire at what point immersion (VR) creates value over pleasure, considering climate-change experiments demonstrating equality with text on facts learned [26]. Cross-domain results—in math reduction of fear and math proficiency and in sailing-English and motion-captured arts training—emphasize that feedback loops, practice, and clear objectives are the transferable ingredients that history can steal [39][29][31].

Conclusion. Do not frame games as containers for content but as practice laboratories for history. Frame mechanics on historian moves, scaffold before/play/drifting after, and test what you seek to teach. Through overt ethics (provenance, multiperspectivity, privacy) and equity accommodations, game-infused history teaching can transition from novelty allure for impressive results and ongoing, measurable learning founded on the interpretive core of the field.

CHAPTER 3

Methodology

3.1 Introduction

The methodological framework used throughout this dissertation combines two research methodologies that are symbiotic in nature: Design Science Research (DSR) and Systematic Literature Review (SLR). The mixed methodology is appropriate for the twin nature of the project: the design of a novel teaching artifact as a use case (a concept video game about Viriato) from one side, and, from the other, to base the suggested solution within existing academic studies regarding game-based learning and digital heritage.

DSR facilitates the development and concept evaluation of the proposed artifact, whilst SLR guarantees that the research is underpinned by a strong and comprehensive review of the existing knowledge within the respective fields. The two methodologies combined permit the project to be exploratory as well as evidence-based, connecting theory and practice.

3.1.1 Design Science Research (DSR)

DSR is a process for developing and assessing artifacts that address problems which have been recognized within a certain setting. DSR is carried out through a six-step iterative process, as depicted in Figure 1:

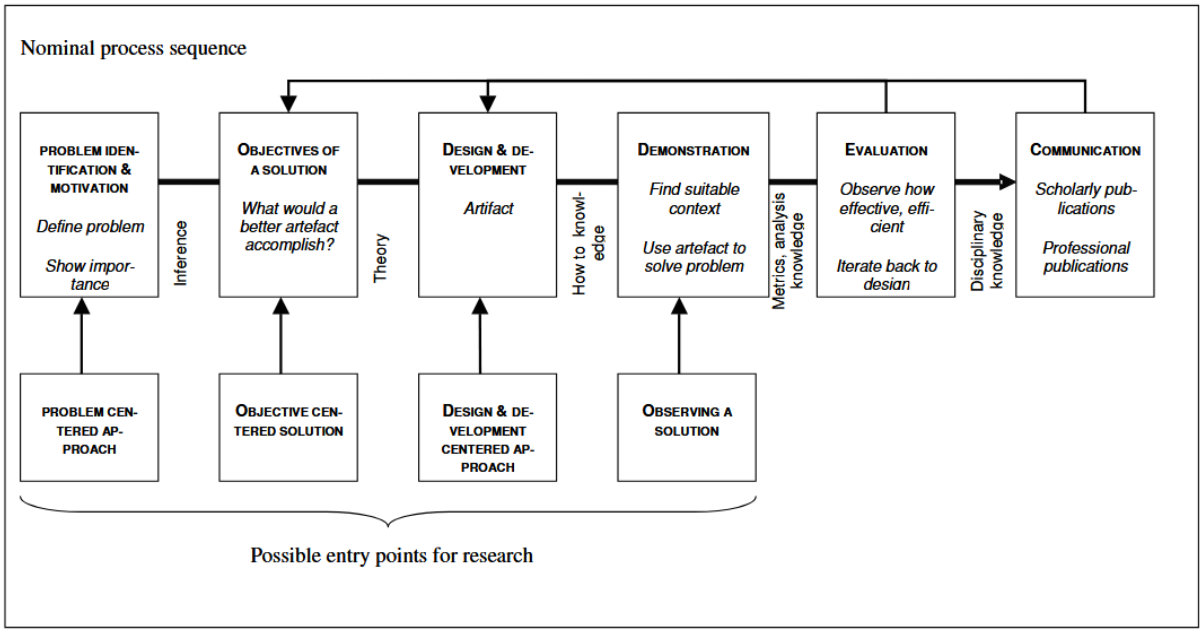


Figure 1 DSR Methodology Process Model

Phase 1: Problem Identification and Motivation

This is the phase of understanding the problem space. For this dissertation, the principal problem is the decreasing interest of younger generations with formal education—specifically history—and the absence of culture-localized, web-based educational resources that are engaging to contemporary learners. Discussed in Chapter 1.

Phase 2: Definition of Objectives

Here, the purpose of the proposed artifact is laid out. The aim is to create a conceptual 3D RPG game which employs interactive storytelling and discovery to enhance the level of engagement of the students, encourage critical thinking, and rekindle interest in national history. Discussed in Chapter 1.

Phase 3: Design and Development

This phase is the actual creation of the artifact, in this instance, a playable prototype. It encompasses the structure of the storyline, gameplay mechanics, as well as the educational rationale for the game's design. Discussed in Chapter 4.

Phase 4: Demonstration

During this phase, the conceptual design is turned into a functional prototype. It acts as a proof-of-concept to verify that the intended solution is technically possible and pedagogically valid. Discussed in Chapter 5.

Phase 5: Evaluation

The game concept is then analysed against pedagogical and cultural frameworks established through the review of the existing literature. The analysis looks at whether the concept solves the problems recognized and achieves the declared goals. Discussed in Chapter 5.

Phase 6: Communication

The outcomes, justification, and implications of the project are presented through this dissertation. Future directions for research and applications are outlined in the concluding chapter. Discussed in Chapter 6.

3.2 Literature Review

This literature review lays the foundation for the subsequent analysis by examining the scholarly discourse on game-based learning (GBL) and its implementation in historical and educational contexts. Emphasis is placed on the cognitive, motivational, and pedagogical affordances of video games and interactive platforms as educational tools.

3.2.1 Systematic Literature Review Approach

To make the review comprehensive, a systematic literature review (SLR) approach that followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) standards was used. PRISMA is an accepted framework intended to advance the reporting effectiveness and methodological clarity of systematic reviews and meta-analyses.

PRISMA offers a formal structure for the identification, screening, eligibility appraisal, and study selection of studies for a review, usually presented through an agreed-upon standardized diagrammatic figure. By using PRISMA, the review process becomes rigorous, reproducible, and transparent, with readers being able to better evaluate the findings for validity and reliability. This process ensured that the literature of interest was thoroughly and systematically captured and that the process of selecting the literature was unbiased.

Databases and Sources

The literature was sourced from major academic databases using the search terms provided on the next subsection:

- Scopus (n = 755)
- ACM Digital Library (n = 307)
- EBSCOhost (n = 15 790)
- IEEE Xplore (n = 11)

This resulted in a total of 16 863 records initially identified.

Search Terms and Boolean Strategy

The search strategy combined key concepts to capture the breadth of relevant literature. The Boolean structure used was:

- "interactive media"
- "history"
- "education" OR "student"
- "video games" OR "game-based learning"

These terms were combined using logical AND between concept blocks. The terms were selected based on both conceptual relevance and alignment with the central research questions of this study.

Inclusion and Exclusion Criteria

Records were screened based on several exclusion criteria applied prior to abstract screening:

- Not written in English or Portuguese (n = 613)
- Published before 2015 (n = 6 654)
- Undesired document types (Only Journal Articles and Conference Proceedings) (n = 7 790)

After these preliminary exclusions, 1 806 records were retained for screening. Subsequently, records were excluded for the following reasons:

- Lack of key terms in the abstract ("video games" or "game-based learning") (n = 1 548)
- Out-of-scope topics (Human-Evaluated) (n = 215)
- Duplicates (n = 4)

A total of 39 records were selected for full-text retrieval. Of these, 13 could not be downloaded due to access restrictions, leaving 26 records assessed for eligibility. Additionally, 10 studies were included from a previous search cycle. Ultimately, 36 studies were included in the final review.

PRISMA Flow Diagram

The selection process is summarized in the PRISMA diagram (Figure 2), which outlines the identification, screening, eligibility assessment, and inclusion phases.

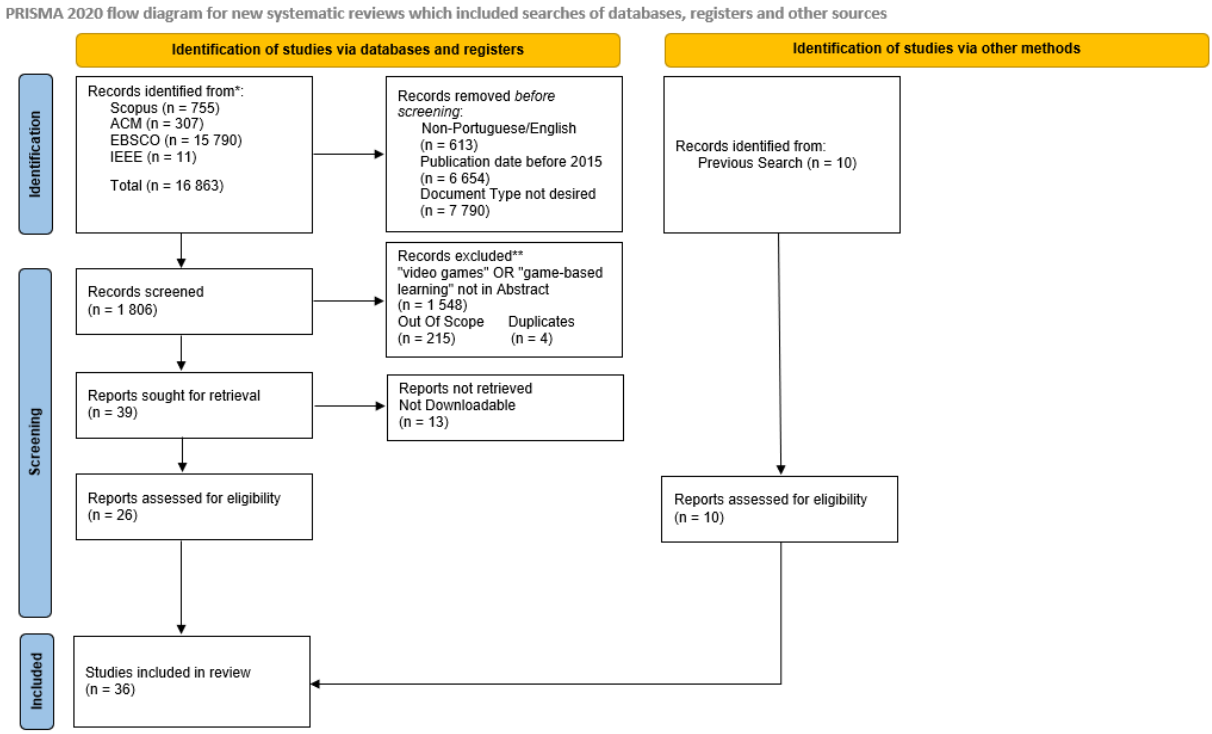


Figure 2 PRISMA Diagram

CHAPTER 4

Conceptual Design

4.1 Design Rationale

This chapter begins from a narrative stance that is deliberate: the player is not Viriato himself, but a close companion whose choices unfold within, not against, the historical spine. That decision keeps agency honest. It lets the game ask for judgment—when to trust a witness, how to read a road, which promise to keep—without pretending the player can overturn what anchors the record. The conceptual design that follows translates that stance into practice: a loop that moves from inquiry to consequence and back again; scenarios that stage different ways of thinking (logistics under pressure, speech in council, governance in scarcity); and a debrief that turns play into a short, own words claim supported by evidence. In effect, the chapter argues that historical play can be both engaging and disciplined, so long as the world answers to sources and the player is asked to show their reasoning, not just their reflexes.

To keep scope, tone, and responsibility clear, the prototype narrows its dramatized window to the stretch from the Galba deception.

4.2 User and System Requirements

The following segment describes the fundamental requirements upon which hinges the success of an educational and historically compelling game experience. By clearly describing the system and the user's requirements, design can sufficiently address educational interaction, historical credibility, player control, and accessibility, both achieving educational objectives and user satisfaction.

User Needs

Engagement and Motivation: The system must involve the users by providing an interactive and immersive narrative experience and foster ongoing Lusitanian history interest, aiming specifically at Viriato.

Historical Authenticity: The players should be presented historically accurate material, enabling significant cognitive and affective investment into events and personalities portrayed by the game.

Narrative Agency: Users require opportunities to influence narrative direction through selection and thus enhance investment and overall learning experience.

Cultural Representation: The system ought to provide for cultural learning by appropriate and respectful representation of Lusitanian habits and significant historical environments.

Accessibility and User-Friendliness: The game play experience must be intuitive, inclusive, and easily accessible to players at all levels of history and game-playing ability.

System Requirements

Interactive Narrative Structure: The game system also must manage branching stories, interactively reacting to the choices of the user and yielding substantial narrative progression.

Historical Content Integration: Proper representation of history facts—including people, settings, and happenings—needs to be confirmed via consultation with history experts.

Immersive Game Mechanics: The system must include intuitive game mechanics suitable for history immersion, such as stealth missions, strategic decisions, and exploration.

Character Interactions and AI: Realistic and contextually fitting interactions with non-playing characters (NPCs), be it historic figures, must be enabled by sophisticated AI systems.

Educational Feedback Mechanisms: Integrated mechanisms for reflecting on historical choices and their consequences must be embedded, reinforcing educational outcomes through informal assessment.

Technical Performance and Accessibility: The game must be technically optimized to provide the game with stable and responsive performance across multiple platforms, as well as accessibility features enhancing usability for all players.

4.3 Protagonist and Narrative Framework

The proposed game would have a narrative wherein the player is a fictional protagonist rather than Viriato. Through this frame, a two-layer system is achieved: a history-driven spine that follows the known history of the Lusitanian rebellion, and a strand driven by the player that allows freedom in moment-to-moment gameplay, relationship development, and emotional investment. By separating authoring of history (Viriato's actions and big consequences) from authoring of experience (the

consequences of the player's actions as a character protagonist), the design can be true to the record and still be alive, surprising, and intimate.

Lanico—the central character—acts as the player's point of entry into the rebellion. Once an ordinary figure shaped by the frontier life's hardships, Lanico falls within Viriato's sphere and interacts without upsetting underlying event progressions with major historical figures. Through reconnaissance missions, raids to secure supplies, parleys amidst suspenseful tension, and argument within camp councils, players watch represented within playable systems instead of exposition to the virtues celebrated around Viriato—leadership, self-control, and determination—the values that made him a successful war leader. Morale, trust, and a reputation meter shape how companions and village councils react to Lanico's decisions; routes chosen across treacherous landscape shift danger and supplies; and conversation choices open or seal alliances, while broader war benchmarks remain in force.

This design still honours Viriato’s integrity as a cultural symbol. He appears as conscience, commander, and mentor at key moments but not as a direct power fantasy played by the player. Appropriately, the game grants productive agency where history does not accommodate who Lanico saves, preferred tactics, vows that remain sworn, and how they personally define “freedom” under coercion. Branching scenes reflecting personal war costs—loss, loyalty, and compromise—are made without reconfiguring accepted record. A living codex accessible through exploration and conversation embeds these experiences in sources and context to maintain history-based narrative informed but not rigid-documentary.

By becoming Lanico, gamers act out the Lusitanian war instead of watching it passively. They may be called upon to compare then and now—to see how mass decision-making, municipal governance, and standing fast against empire have a lasting impact across centuries—while this game's third-person action RPG gameplay provides a popular, contemporary medium to save and transmit this patrimony.

4.4 Key Narrative Events

The narrative is structured around three major historical occurrences that make up the personal experience of Lanico and the collective destiny of the Lusitanians. They combine educational realism with drama-driven narratives and interactive game play.

4.4.1 The Galba Massacre

Just before the great revolt, the Lusitanians were yet trusting Rome to bring peace to their lands. The Praetor Galba had assured them rich soils, the opportunity to drop their arms and live in peace, without war. Entire villages left their homes in expectation: men, women, kids, elderly people — altogether in the spot Galba designated. There they stood, without a defence, the weapons thrown away, in trust to the Romans' vow.

But the gift was a falsehood. At morning, the Lusitanians beheld the dust of marching legions on the skyline. Bands of Roman steel closed in a ring around them, tightening tighter yet like a wolves' trap on defenceless prey. No battle was there — mere slaughter. Blood stained the ground, and wailings filled the air as thousands perished.

In the midst of the bloodbath, one young tanner called Lanico escaped by crouching beneath the lifeless forms of his family. The silence came again, and the Romans marched away; he emerged from the slaughter field bloody, shattered, but afire with revenge. He was one of the rare ones to bear the memory of Galba’s betrayal, roaming within Lusitania to remind each tribe that Rome’s peace was simply betrayal. That day on, his existence was the property of vengeance.

4.4.2 Tribola Battle

A few years after the massacre, praetor Caius Vetilius marched into Lusitania tasked to achieve peace once and for all. He found before him a host of Lusitanians — warriors from scattered tribes, united in defiance but without a leader to guide them. Overwhelmed by the sight of the disciplined Roman legions, the Lusitanians faltered and retreated. Fearing annihilation, they sent messengers to Vetilius carrying white flags, begging for peace.

The Roman agreed, insisting they show up the next morning to ratify the treaty. The news rippled through the camp of the Lusitanians, and most gave in to their destiny with heavy hearts. But there was one man who stood up against the despair. A shepherd who turned warrior — who most did not know — stood up and addressed the others in flames. He remembered them of Galba’s betrayal, of the blood-drenched fields where their families died. Would they truly believe Rome now?

Then, like a prudent hunter, he described his scheme. Not very distant lay a plain overgrown with spring grass. But beneath the smooth green were innumerable hidden gorges and gullies. Snow had covered them in the winter, and when spring arrived grass sprouted thick over the thawing frost, making a perilous carpet to support a score of men but not the passage of an army.

This man was Viriato. From that moment he was no longer just a voice in the crowd — he became the spirit of the rebellion, chosen by fate to lead the Lusitanians.

When morning broke, no Lusitanian came for the surrender. The horizon, however, had a thin line of warriors. With victory near, thought Vetilius, he bade the legions to charge. The Lusitanians retreated, breaking into two sections to entice the Romans deeper into the plain. Then the ground betrayed Rome. Legionaries tripped and fell into trenches covered over by the grass. Horses shattered their legs; men helplessly fell into the ground and were slaughtered without pity. The great Roman formation broke. Terror ran, and the legions faced about to turn tail. In the rout, Vetilius himself fell to the blades of the Lusitanians. Some accounts report it was Viriato who overtook him and saved his life to scorn him, saying he was not even worth a denarius. Others report it was fate that struck him down to atone for Roman hubris.

And there, in that moment, Lanico — who had survived Galba's killing and now fought within the Lusitanian army — looked at the man who would be his chieftain for the very first time. Seeing Viriato's genius and his bravery, he swore allegiance and bound his fate to the man who had turned despair into success.

4.4.3 Viriato's murder

Lanico arrives cold still. The camp should be changing guard—mutter, boots, clinking cups—but something has gone awry. A runner passes along the inner cordon without the call-and-response, eyes locked on the heart ring of tents. The shift captain observes him depart, jaw tight, and says too hastily that the men who came in the night were emissaries, old names, the sort who never had to be checked.

Near the centre fire a grime-black ledger rests open where it should not. Three names are installed in the margin, the ink bled heavy from a hurried hand. To its right, the flap of the commander's tent stirs in the wind. Within, it is as it always is and not as it ought: armour accessible, bedroll drawn tight, a strap worn through in the throat. There is no fallen stool, no kicked embers, but a stillness that proclaims itself more loudly than any alarm.

Word diffuses unequally, beginning as denial and falling into a silence that is a caught breath. Men who have stood against cavalry gaze at their hands as if they have lost the use of them. Someone declares the envoys are already on the Roman road, that the murder was purchased, that Rome does not reward traitors; someone shushes him up, not to spare the Romans but to spare the dead.

By noon the leaders have reeled. The conversation is hushed and wary: how to inform the villages, if to kindle the pyre prior to darkness or to secure the enclosure first, how to convey the words that must be conveyed. No man fancies that another will be Viriato. They talk instead of what is left: roads to read, mouths to feed, a winter that will not be swayed by mourner. A name is substituted to hold fast the standard, not to take the man but to prevent the line from bending, that men is Lanico, who was now a close friend of Viriato.

When finally, the sun sinks, the camp assembles unsummoned. Torches form a ring around the bier; songs are sung that are the property of no one's childhood. Ash ascends into the night and does not descend soon.

4.5 Core Game Loop and Progression

Consider the game as a vast rural landscape whose main storyline is a highway you can at every point stay along, but which has various roads and roads that branch out and intersect it. You decide when to remain along the highway and when to roam.

How a generic play session perceives.

You set out from a safe base (a camp or village) with a specific objective from the main story— for example, you want to get to a hill fort and talk to a commander. Guidance comes from the map, but the terrain does the talking: a valley's smoke signals danger, a passing traveller waves you over, a patrol ambushes a bridge. You choose to ride on, talk, sneak, or fight. If you manage the interruption, you make your way to the objective and the main mission plays out (conversation, a duel, a set-piece battle). When you are finished, you can press on or return to base to mend gear, upgrade tools, and map out the next excursion.

Main stories and side stories.

Main stories are the campaign's backbone. They progress history, bring in key characters, and open new areas. Side stories are non-mandatory stories distributed throughout the world: a village that needs assistance, a roving veteran to rout, a shrine that unravels a tiny enigma. It is never necessary to do side stories, but it makes the world seem populated and provides real-world advances—new companions, skills, equipment, or safer itineraries. You may do none, a few, or many between main chapters.

“Clearing” enemy sites and why it’s important.

Throughout the map, occupied areas—checkpoints, logging camps, hill forts—function as knots in the rope. When you clear a sector (by stealth, by combat, or shoring local gangs to your side), three things happen: the location shifts hands visibly; roads nearby become safer to you and non-hostiles; and services become available to the player (a merchant sets up, a blacksmith arrives, fast-travel options become accessible). Clearing a few locations in an area makes long travels less deadly and provides alternate means to latter main missions.

Explore, fight (and repeat).

Most missions flip between stillness and tempest. You’ll ride, see something intriguing (a glint of an artefact, a party advancing in formation), and explore. When fists fly, you have combat: you close ranks, select targets, manage timing, and employ skills you have gained (stances, tosses, parries). Duels are individual challenges of time and nerviness; skirmishes are fast clashes against little groups; set pieces are bigger fights with stages and room to employ environment. Then the world stabilizes: civilians reappear, a route clears, a storm ends, and the player is free to move on.

Player development.

Progression isn’t merely numbers increasing. Early game hours reward caution and savvy routes; later, new skills enable you to tackle larger groups or try higher-risk duelling. Reputation alters how you are greeted, and which doors are accessible. Gear upgrades don’t merely increase damage; they unlock tactics (quieter movement, better guard, longer grapple). The world “remembers” successes: areas you have assisted are discernible different when you return.

Freedom without muddle.

The game always gives you a clear next step for the main storyline—displayed gently on the map and supported by NPC speech—so you are never lost. But it never presses you. If something in the distance distracts you, go. If you feel like spending an hour along the spine, the world will not begrudge you. When you stop and consult the Codex, you’ll get brief, spoiler-safe comments about places you’ve been, persons you’ve already encountered, and artefacts you have actually picked up. It’s there to tell you why a valley is important or who flies a certain banner, and you may read it whenever you like without breaking the flow.

Failure and second chances.

If a duel goes bad or a camp overwhelms you, you re-play nearby and do something different—alternate route, another tool, or a side quest first to level up. The idea is momentum: the path remains accessible, and every try teaches you something about the landscape or the enemy.

A chapter, from start to finish.

A primary chapter may commence with a rumour that a Roman unit is preparing a pass. You ride out, remove two roadside sentry posts to enable merchants to resume, assist a village with a side request that nets you a local guide, and arrive at the pass for a bigger fight that advances the frontier. Back in base, the map indicates the new line, the Codex gets updated to what you've been through (no spoilers), and companions react to what you did along the route. Then the next chapter's signals appear on the map.

4.6 The Codex

The Codex exists to maintain a consistent, coherent world without slowing it down. In earlier sections of this chapter, a case was made for a combat-led, storytelling experience in which the player controls when to stick to the main path and when to explore. That liberty is strong—but it also diffuses focus. After a long horseback ride, three skirmishes, and a side trip to rescue a village, it's simple to lose track of whom asked for what, why some banner is important, or how today's combat evolved out of last week's decision. The Codex fixes that headache. It's the memory of the game, inscribed just from actions the player has truly taken (places defended, people met, events, artefacts...) and it's always a button press away when the player needs context.

It makes "what just happened" become "what this means." Each log entry is concise and spoiler-friendly, detailing the importance of scenes and objects that have been encountered, so choices are informed and not arbitrary. It also makes earlier stated design philosophy apparent in the UI. Difficulty was argued to come from tactical and storytelling consequences, not from interface resistance; the Codex updates unobtrusively after play and never interrupts a duel or freezes progress. It was emphasized earlier for responsible handling of history and not trivia checks, and the codex delivers that.

In addition to recording experience, the Codex provides brief background when it assists the player in reading the world. If you read a page of a Roman captain you encountered, you'll find a few sentences detailing their cohort, standard tactics, and known foes—as learned in-world from past encounters, local legend, or seized orders. If you examine a retrieved artefact, the entry provides what it probably was employed for, who would prize it, and where such items are regularly found. Each of

these context notes is designed to be concise, spoiler-safe, and provenance-tagged (e.g., “eldest’s account,” “fragment of inscription,” “camp quartermaster”), so the player learns but isn’t told the future.

The Codex pays its own way back. A Chronicle for a hill fort the player freed two chapters back reminds him who controlled it and why the road beneath is now a safer route; a Profile for a captain he spared clarifies an altered salutation when you reencountered him; a Relic note for a sash taken in combat explains who may identify it at a local market. These are concise, descriptive memories that make exploration and combat decisions seem integrated, not episodic.

Lastly, the Codex is individual. Two players will not read the same pages since their paths branch out. If you opted to establish a perimeter before funeral rites, your Chronicle reflects that; if you boosted a rumour to get morale, your entry retains both the action and its uncertainty flag. Cumulatively, throughout a long campaign, that build-up generates this run’s memory—a subtle through-line that underpins the chapter’s key promise: a vast world in which the players is free to wander and fight and nonetheless not lose the thread of his actions and why they made a difference.

4.7 Cohesion & Traceability

This chapter makes a case for a single experience and constructs it from various directions. Design rationale sets the pillars (open-world agency, narrative weight, combat first). System and user requirements make those pillars constraints that the game must adhere to: a world that remains legible and non-gated, encounters that scale in complexity and not in spectacle, and UI choices that never brake momentum. Choice of protagonist and narrative frame—Lanico alongside the spine, not over it—reminds the agency to stay honest and does not let the tale promise things the history cannot deliver. It's the key narrative moments that are the anchors that provide the open world a sense of direction; they are the places that the highway must go, even when the player deviates. Then the core game loop outlines what the player does between those anchors—ride, notice, decide, fight, recover—and why that cadence pays out that many times that many hours. Lastly, the Codex provides the whole structure a memory: it stores in what has been lived, provides just enough context to make the next decision make sense, and indicates speculation where the design must join the dots.

Combined, these are a whole contract to the player. Freedom is true (the map comes undone, order of side stories is yours), but the world still makes sense (anchors are there, Codex retains, NPCs respond). Combat leverages the narrative (clearing a location alters paths and reputations), but narrative makes combat meaningful (who controls this ridge and why it makes a difference is always a click away). Progression is felt as skill and consequence and not checklist: new skills broaden possible tactics; cleared areas replenish populace; decisions resonate in greetings, prices, and entry.

CHAPTER 5

Implementation

5.1 Purpose and Scope

This chapter documents the conduct of a proof of concept (PoC) of the game described in chapter 4. This aims to test the game's core mechanic, history and storytelling method of incorporating history into a game's narrative, and Codex focusing only in one scenario, Galba's Massacre.

A proof-of-concept game's top priority should be simplicity and traceability.

Extent of the PoC

One playable narrative segment with a small amount of combat and interaction.

A Functional Codex (in-game knowledge base) that supports progressive unlocking.

Out of scope

Full level progression, advanced AI, or more content than the scenario presented.

Final art/audio pass and optimization for specific platform needs, achievements, or localizations.

5.2 Technical Architecture

The prototype was developed in Unity 6 LTS, using the Universal Render Pipeline (URP) to keep rendering performance stable on typical classroom/lab hardware while still supporting clean lighting and readable visuals. All gameplay, interaction logic, and interface behaviour were implemented in C# following Unity's component-based approach, which makes it easier to iterate on features without redesigning the whole codebase. The build target is Windows PC (64-bit), packaged as a standalone application for straightforward installation and use in school settings with standard keyboard-and-mouse input.

5.3 Third-Party Assets

A few commercial Unity Asset Store assets have been employed to expedite the development of the PoC. Some of these assets belong to commercial owners; therefore, their respective files are not stored in the public repository in accordance with the Unity Asset Store EULA and for respecting the respective authors' licensing agreements.

Commercial assets referenced in the PoC:

- Roman Centurion (character)[40]
- Celtic Village (environment set)[41]
- UMA Tribesman (male & female)[42]
- Roman and Celtic Pack (weapons)[43]

- Medieval Falcata (weapon)[44]
- Third Person Controller (toolkit)[45]
- GAIA Pro + VS Terrain/Trees/Grass/Water for Unity 6 (terrain/world)[46]
- UMA 2 (character system)[47]

5.4 Visual Design and Storyboards

Although only the Galba's Massacre scenario was in scope of the proof-of-concept, a storyboard for Tribola's Battle was also made (see Figure 3 and Figure 4).

5.4.1 Galba's Massacre Storyboard

This storyboard integrates Lanico directly into Galba's betrayal by placing the player inside each step of the episode**. From the promise of peace and the gathering** to the waiting, encirclement, and ambush. It culminates with Lanico surviving the massacre and becoming a witness whose escape motivates the story's shift toward resistance and rebellion.



Figure 3 Galba's Massacre Storyboard

5.4.2 Battle of Tribola Storyboard

This storyboard integrates the player into the Battle of Tribola by tracing the shift from initial resistance to retreat and attempted surrender, shaped by lingering mistrust after Galba's massacre. It then moves into the battle's turning point as Viriato orders a split of the Roman line and the Romans' careless charge leads to a Lusitanian victory where Lanico is part of.

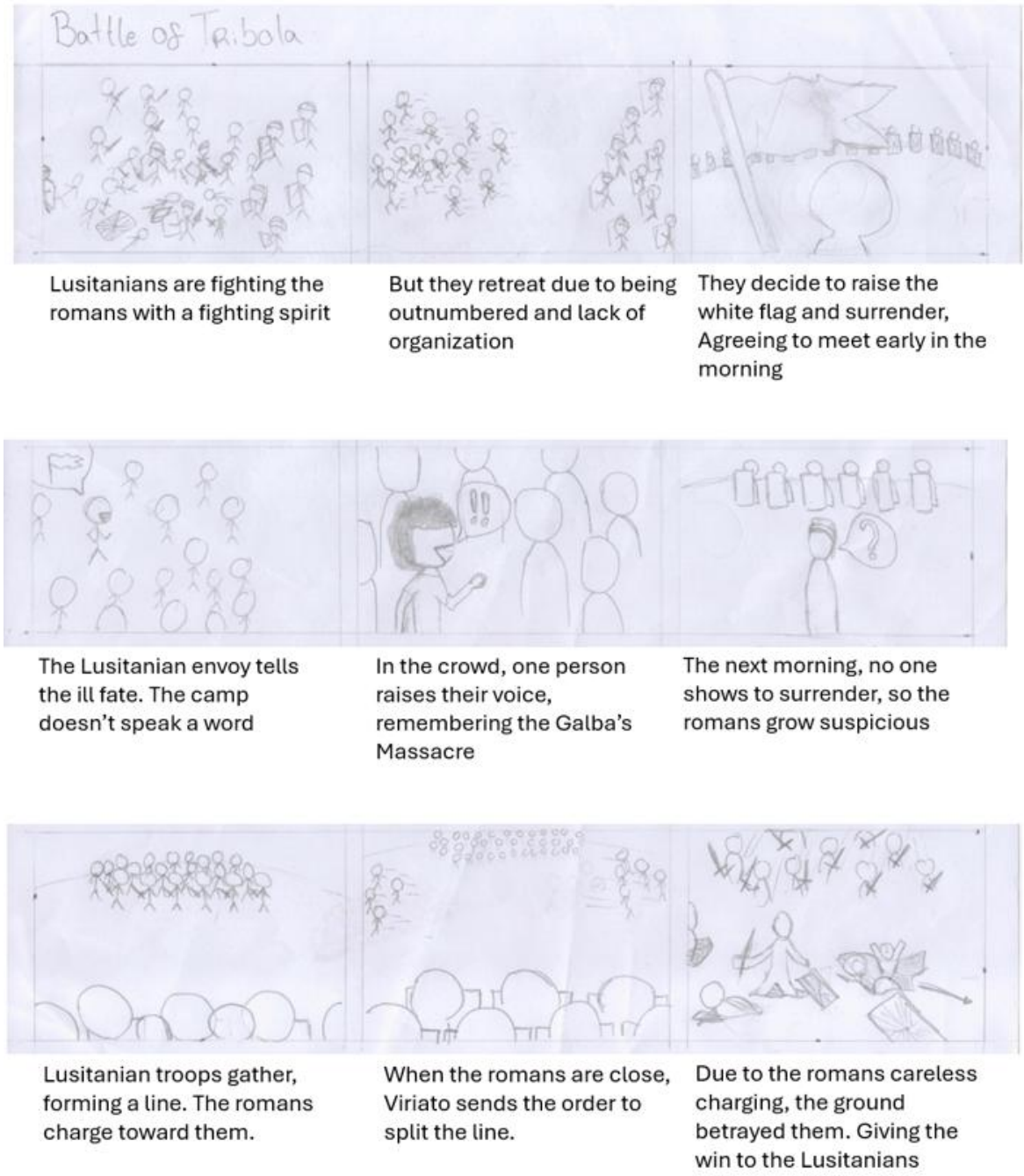


Figure 4 Battle of Tribola Storyboard

5.4.3 The Interamici Village

The Interamici (Interamnici) are a Gallaecian tribe of north-west Iberia, named by their location inter amnes, or "between rivers," which situates them in high country between rivers Minho/Minius, Sil, Limia/Laethes, and Tâmega. Extending from the Augustan age into the Early Empire, they are part of the Atlantic style of Castro culture of fortified hilltops with roundhouses and agriculture/animal husbandry with riverine trade routes (as seen in Figure 5).

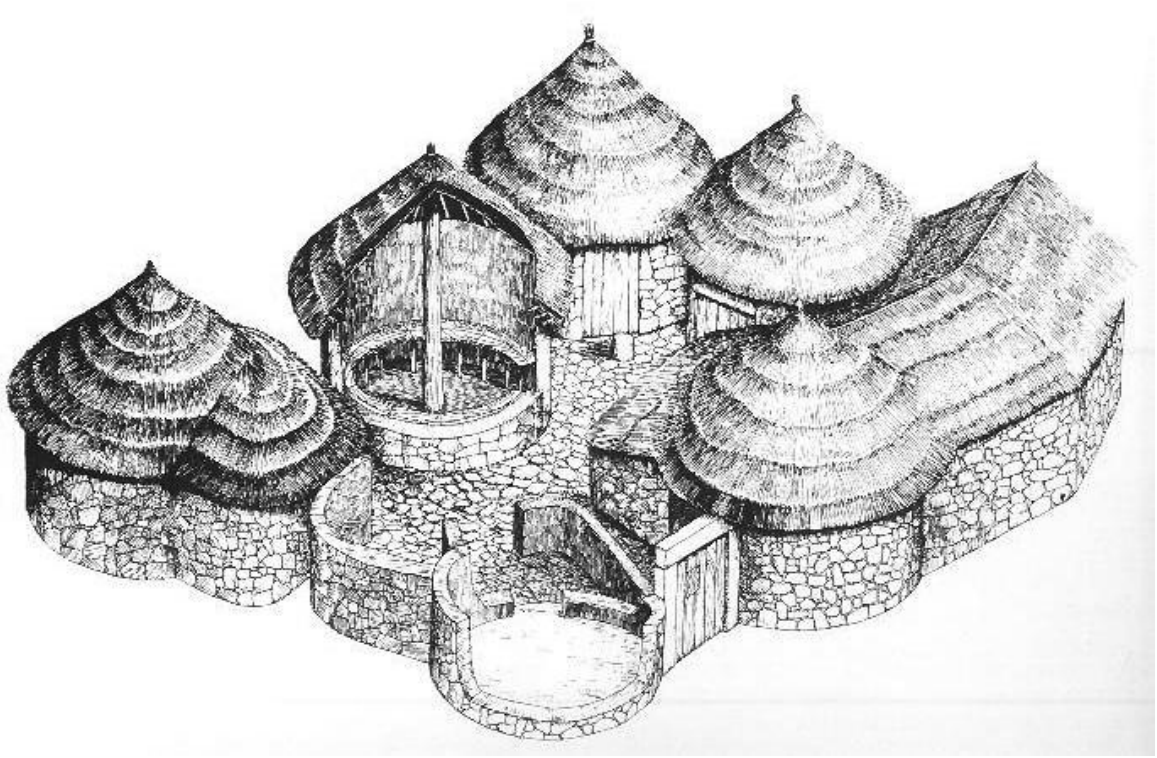


Figure 5 Recreation of a Castro [48]

Lanico, the game's protagonist, is an Interamici; therefore, the game's prologue introduces the player to a small Interamici settlement and their hilltop and roundhouse design with river walkways before the broader narrative develops (as seen in Figure 6 and Figure 7).



Figure 6 In-Game Castros



Figure 7 In-Game Village

5.4.4 The Romans

The Romans appeared from Central Italy in the First Millennial BCE, developing from a Tiber River city to a republic (509-27 BCE) and then to an empire during the reign of Augustus (from 27 BCE). Roman power hinged on armed citizenship and later a professional soldier corps plus roadbuilding, taxation, and a strong legal tradition (citizenship, contracts, municipal self-government).

Latin was disseminated with local languages; per art, religion, and architecture, Greek and Italic patterns were assimilated. Through the 3rd to 4th Centuries CE, the imperial system was Christianizing and partitioned; the Western Empire disintegrated during the 5th Century CE while the Eastern one survived. Given the game's context and period, the Romans' presence can never be absent because of its importance as conquerors and military authority; road builders; tax collectors; and legal authorities governing life at the north-west Iberian fringes. A preview of in game roman troops can be seen in Figure 8.



Figure 8 In-Game Romans Envoys

5.5 Gameplay

This section explains the playable design of the proof-of-concept and the design of each scene to enact the key game mechanic of 'observe, act, reflect' (through Codex). The focus here will be on the design of the game's scope that highlights the Interamici prologue village and the slice of Galba's Massacre. This design discusses the learning and storytelling objectives of each slice, the flow of the scenes, and interactions and unlocking of Codex. This design is directed towards facilitating a template for scaling the proof-of-concept.

Codex objects which can be interacted with are visualized by a gentle indication of interactivity. A glowing yellow particle emitter circles every Codex object, while the objects themselves are highlighted by a yellow glow that separates them from non-interactable scenery objects. Slow rotations and bobbing animations serve to indicate objects to players without being obtrusive; some objects use these to catch the eye without being annoying. This level of design uniformity can be found for all Codex objects.

5.5.1 Prologue

Once entering the village, the player automatically gains access to a Codex entry that gives a brief background on the Interamici. This space serves as a micro-hub that promotes unrestricted exploration of interactive points of interest.

A sparring dummy can be accessed for optional sparring that lets the player test some basic fight moves without repercussions (shown in Figure 9).



Figure 9 Lanico fighting the dummy

Further interactable objects unlock Codex entries relating to material culture. A falcata of medieval design—a single-edged, inward-curving Iberian sword well suited to deliver powerful chopping strikes—unlocks a page concerning local weapon designs and metalworking (codex object shown in Figure 12). A gladius—a short Roman sword with a double-edged straight blade well suited to close-order thrusting—unlocks a page concerning legion arming and warfare (codex object shown in Figure 11). A group of barrels and Roman armour unlocks an entry about the Romans as a faction (codex object shown in Figure 10). One can access all these optional objects to read more about a particular figure or location by clicking on a few associated entries for each.



Figure 10 Roman Armour (Codex)



Figure 11 Gladius (Codex)



Figure 12 Falcata (Codex)

For the player to advance to the next scenario a mandatory interaction with the Roman envoy who is stationed at the centre of the village is required (shown in Figure 13). During this encounter, a short dialogue takes place where the Roman envoy states that Praetor Galba is assembling a peace meeting with it comes offers of land, this dialogue is demonstrated in Figure 14.

The player is first asked if he is ready to leave. Clicking Proceed switches to the next scenario, Galba's Massacre, otherwise the player can refuse and end the dialogue without disturbing the ability to freely explore while being able to begin this dialogue at any time.



Figure 13 Roman Envoy

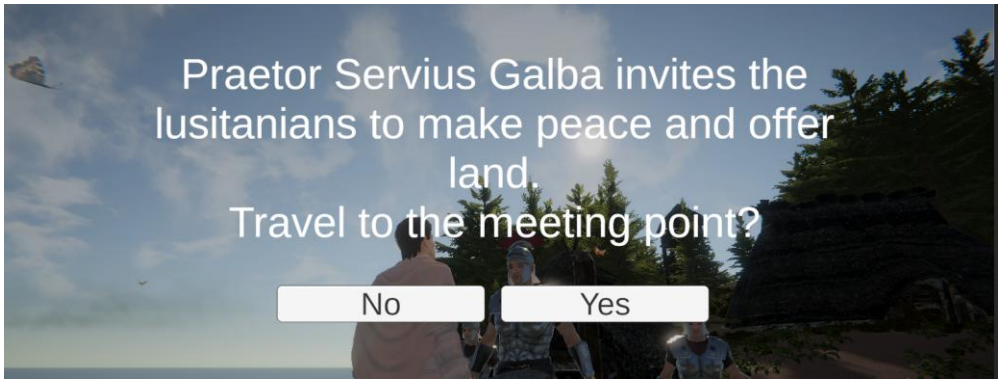


Figure 14 Envoy Dialogue

5.5.2 Galba's Massacre

This situation presents a controlled combat vignette with a scenario of being surrounded by Romans.

This fight takes place in a closed arena with no escape points to emphasize the fight. Three enemy entities Spawn prior to the previous enemy being killed to control the amount of information that can be processed. Failure doesn't incur penalties since the game automatically resets to the initial position without backtracking to strengthen the narrative.

Successful completion of the fight unlocks a Codex entry detailing the fight that has been undertaken and automatically teleports the player to the next scenario. A stealth-based codex pickup mission. Figure 15 and Figure 16 display snapshots from the mentioned scenario.



Figure 15 Lanico fleeing a roman soldier



Figure 16 Lanico fighting

5.5.3 Stealth Scenario (Extra)

In this scenario Lanico finds himself in a dim forest with just a few lights scattered and he is not alone in the forest. Roman units patrol the space guarding siege weapons for a future fight (show in Figure 17).

The player must traverse the forest, reach each weapon, and collect the corresponding Codex page, which in fiction simulates sabotaging or destroying the engines. Stealth is mandatory. If the player is discovered, he is teleported back to the beginning of the scenario.

The romans are guarding two types of siege weapons, a ballista (Figure 18) and an onager (Figure 20). The mission concludes when the player unlocks both codex pages without detection (as show in Figure 19). Once that happens, the player is teleported back to the Interamici village to analyse the codex he expanded throughout his journey, thus completing the proof-of-concept.



Figure 17 Roman Guarding the Siege Weapons



Figure 18 Ballista



Figure 19 Lanico hiding near the weapons

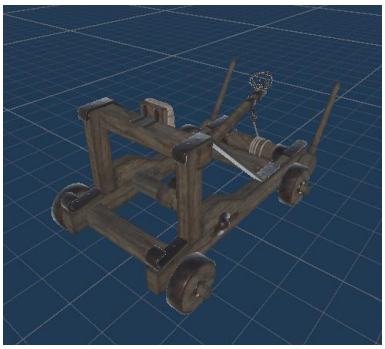


Figure 20 Onager

5.5.4 Detection Mechanism

A "vision cone + line of sight sampling" is used by the enemy AI to create a meter of awareness. After a timer cycle, it first checks if the player is in the field of view (angle + distance) (demonstrated in Figure 21). If true, it fires multiple rays from head/eye to sampling points on a capsule representing the player. If rays are blocked by layers of the occlusion mask, they are "not visible" (red rays) (shown in Figure 22 and Figure 23).

If the count of visible rays reaches the given threshold (e.g. 50%), it will increase the detection meter. Otherwise, it will decrease. The speed of increase is dependent on how much of the capsule is visible and how far the player is (closer means it will increase faster), which provides smooth buildup awareness minus the "instant spotting."

Reaching the maximum detection will end in a "DETECTED" screen fadeout, as seen in Figure 24, after which there will be a callback (in the stealth scenario a player respawn).

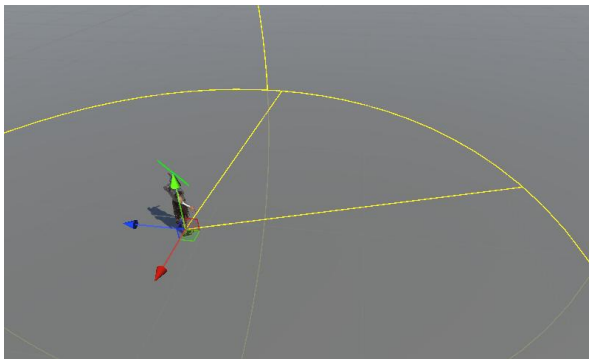


Figure 21 Enemy FOV

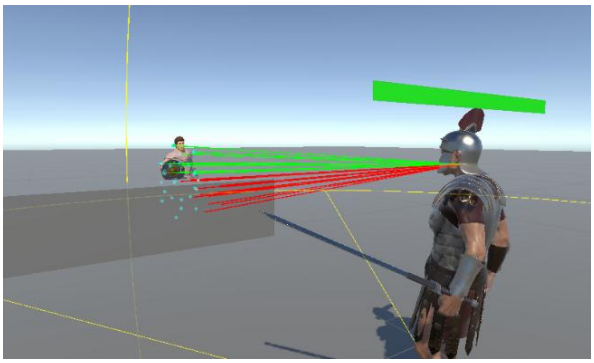


Figure 22 Detection Raycasts

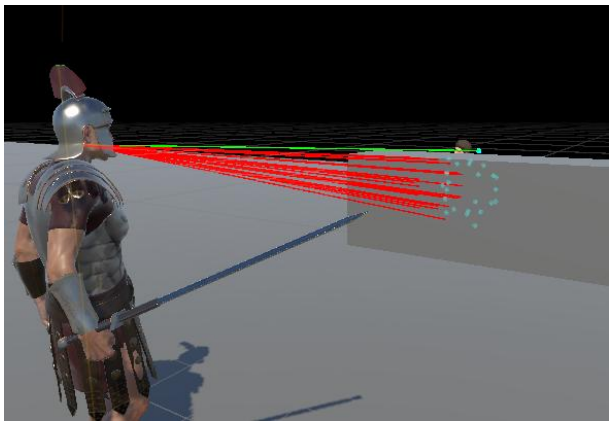


Figure 23 Lanico not being detected



Figure 24 Detected fade out screen

5.5.5 The Codex

The Codex can always be accessed by going to the Pause menu. Functionally, it aims to serve as a reflection space where one can view objects and characters explored during gameplay against their background context.

When opened, the interface offers a three-column arrangement:

(1) a left pane listing all unlocked entries.

(2) a Preview pane that offers a representative object or model of the current entry selected (for example, selecting entry Falcata to view the falcata asset)

(3) a right pane featuring the lore text with a brief context and connections to other entries.

The Codex is a content-driven subsystem that's UI-centric. It layers the concept of a separation between data (entries as assets), behaviour (controllers), and the UI (and preview camera), which enables content to evolve without touching code and provides predictable rendering/input.

Data

- CodexEntry (Scriptable Object (SO)): entryId, displayName, description, modelPrefab and flag to unlockedByDefault
- CodexDatabase (SO): holds the actual entries. UI filters by 'unlocked' at runtime.

Runtime & UI

- Codex UI: creates the left list from the database + unlocked set, shows text on the right, spawns the entry prefab into a middle Preview Stage, and surrounds it with a standalone Preview Camera.
- PreviewOrbit: slow auto-orbit; mouse drag control, confined to the preview area.

Unlocking (Single API)

All interaction go through CodexUI.Unlock(entryId)

- Data-driven: unlockedByDefault
- World events: pickups, encounters (last kill): all call `Unlock{id}`.

How to create an entry

(Optional) Create a self-contained preview prefab (looks good at origin).

Create Codex Entry → fill id, name, text, prefab, pose hints, default unlock.

Create a Codex Database and assign the created codex entry.

Figures 25 through 32 present the complete set of codex entries included in the proof-of-concept.

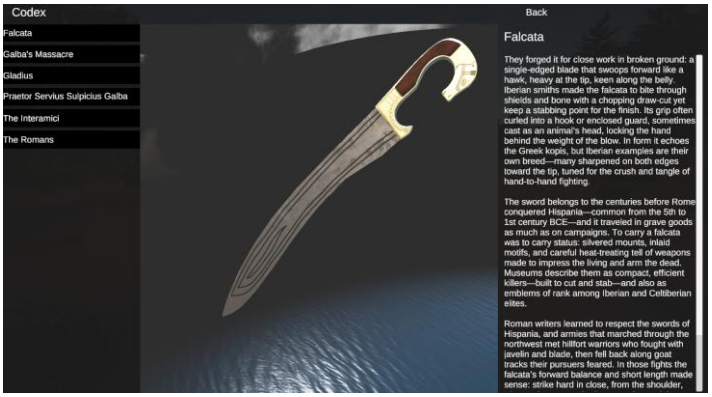


Figure 25 Falcata Codex Entry

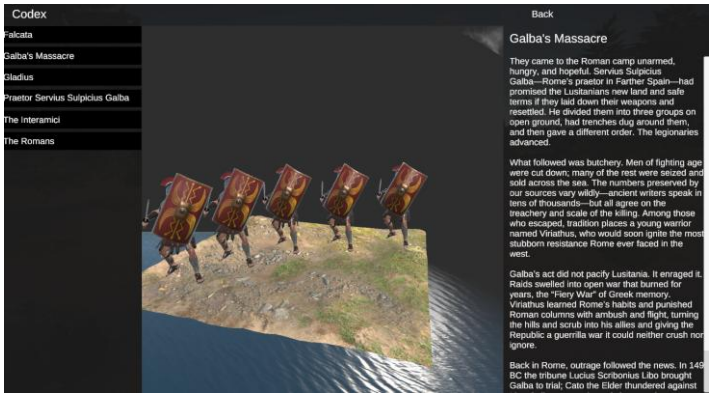


Figure 26 Galba's Massacre Codex Entry

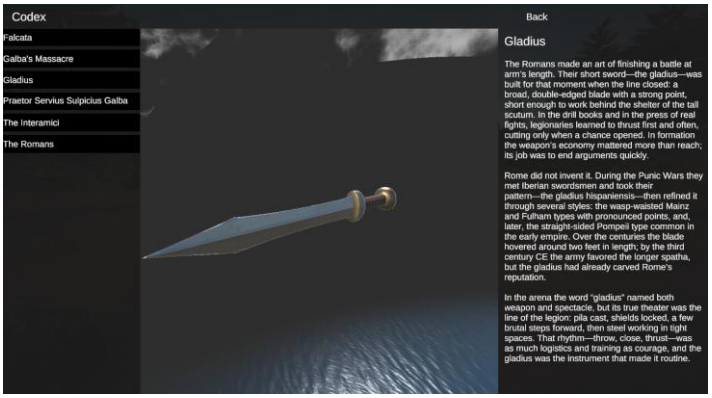


Figure 27 Gladius Codex Entry

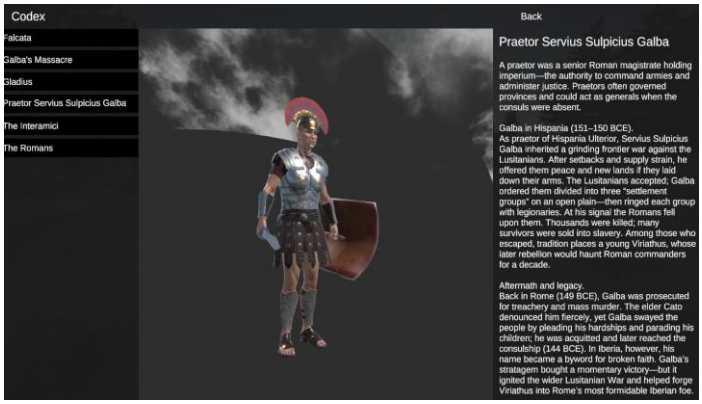


Figure 28 Praetor Servius Galba Codex Entry



Figure 29 The Interamici Codex Entry

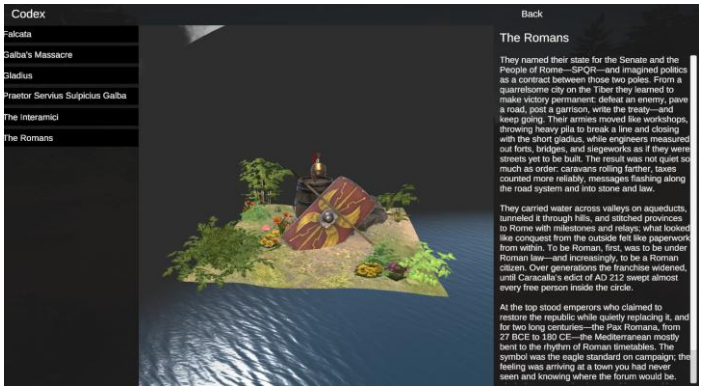


Figure 30 The Romans Codex Entry

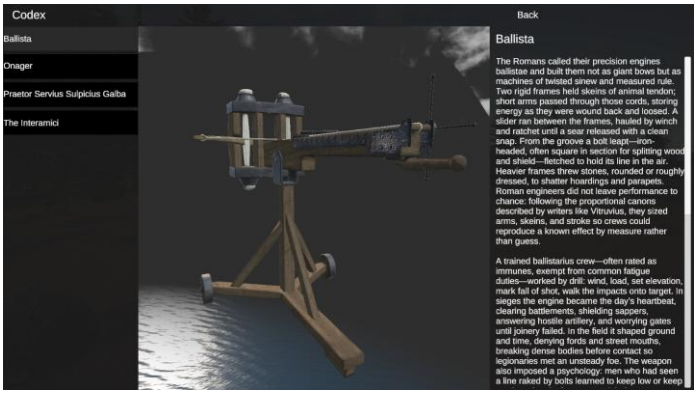


Figure 31 Ballista Codex Entry

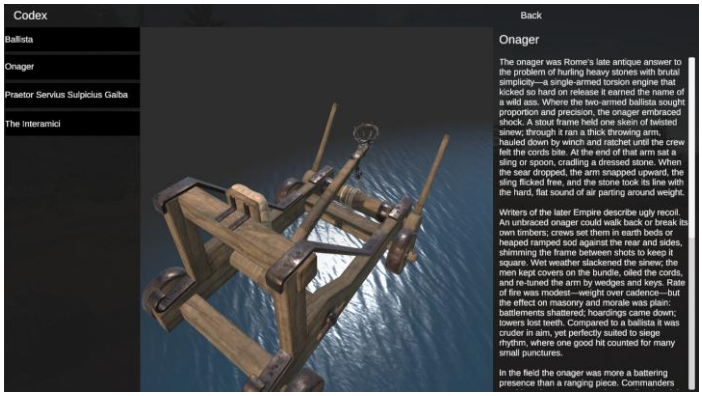


Figure 32 Onager Codex Entry

All In game codex entries available in the proof-of-concept.

The developer is not restricted to use just one asset as the preview, he can build dioramas, as seen in the Interamici, Romans and Galba's Massacre entries.

5.6 Qualitative Evaluation

5.6.1 Purpose and Scope

In this section, the extent to which players interacted and learned a particular historical topic introduced in the prototype (the codex entries regarding ballista, onager, Interamici, praetor/Galba, gladius/falcata, and Roman statecraft) will be examined.

The scope of this evaluation will remain focused on perception and knowledge acquisition pre- and post-play experience in relation to think-aloud procedures and brief exit sessions.

Usability and game quality are not the object of this evaluation.

5.6.2 Instruments

To complement observations, a lightweight pre/post questionnaire was administered:

- **Structure:** 21 multiple-choice items (answered twice: **BEFORE** and **AFTER** play), 2 short explanations (also before/after), and a 4-item perception/confidence mini-scale (rated before/after).
- **Target:** concrete facts and relationships from the Codex (e.g., *torsion vs. counterweight; Galba's sequence; imperium/provincia; gladius technique; Interamici geography/evidence*).
- **Scoring:** Multiple choice questions (MCQs) = 0/1; short explanations rubric-scored 0/1 (clarity + correctness). Perception items are not graded (1–5 scale).
- **Administration:** ~10 minutes total; anonymous responses.

The full survey and answer keys, plus item-level results tables, are provided in Annex — Pre/Post Survey.

5.6.3 Participants and Procedure

N = 22 participants (upper secondary through employed Master's-level adults). Procedure: (1) Pre survey, (2) ~20–30 minutes of guided play (with optional think-aloud prompts), (3) Post survey, and (4) short exit remarks.

Observations focused on when/why players opened the Codex and how they used evidence to make decisions.

5.6.4 Results Summary (full tables in Annex)

- Total improvement in MCQ scores: 22% to 71% (pre to post).
- Largest improvements: those directly related to pickups/Codex content—ballista and onager usage, gladius thrust behind scutum shield, and role of Galba.
- Harder concepts: Terminology of Roman magistracy (scope of praetor; imperium/provincia), and timelines (ballista vs. onager) were enhanced but remained suboptimal.
- Brief explanations (rubric): The number of “how a ballista works” and “what triggered Viriathus’s rebellion” correct responses increased
- Perception/confidence: average scores rose (e.g., “explain what Galba did and why it mattered”).
- Counterexamples: There were 4 subjects for whom no consolidation took place in certain items (Chronology and Magistracy), and this corresponds to their incorrect final answers.

To find item-level percentages and rubric scores and perception means, please refer to Annex — Results where pre-values were set to be lower while post-values were better but not to ceiling as a brief duration of exposure was considered.

5.6.5 Triangulation with Observations

Think-aloud and exit statements revealed players referring to details in the Codex ("sinew cords," “earth bed for onager recoil,” “breach of trust by Galba") when explaining decisions. The players in whom cross-links in the Codex were more often used tended to have more specific and correct post-game statements. Points of confusion centred on:

- timeline placement (ballista vs onager), and
- office vocabulary (praetor vs consul; imperium vs provincia).

5.6.6 Interpretation

A substantial increase in knowledge and confidence for the targeted historical concepts is present. Observations regarding user experience suggest that the Codex facilitates a natural left-to-centre-to-right scanning path, where the 3D preview serves as a very effective anchor to memory. The remaining challenges are seemingly discovery and unlock feedback.

The pre/post scores and think aloud comments together indicate that a source-driven Codex and mechanics keyed to specific information (such as torsion cables, onager recoil setup, and Galba’s sequence) are enough to achieve a discernible level of knowledge acquisition for specifics within a brief play-session. The gains are focused where in-game opportunities provide a perceptible 'handle' for grabbing information (3D preview) and brief text-based anchors, as well as where in-game decisions encourage players to open the Codex.

Some users think a loud comments worth mentioning:

“The animal on the falcata’s pummel (in the preview) made me want to read the entry, and then learned it was a custom to decorate the weapons with animals”

“I knew the Lusitanian rebellion started from Roman aggression, but I didn’t realize it began mainly with a breach of trust. I read the entry after the fight and was shaken by how unethical the Romans’ actions were (toward the Lusitanians).”

At the same time, a few persistent confusions surfaced:

“I still mix up which came first: the ballista or onager. I need to read the entries again.”

(Chronology remains suboptimal without visual cues)

“I think I’m not capable of explaining praetor vs consul without the glossary.”

(Terminology needs a compact scaffold)

Limitations.

Results are based on a single brief testing occasion with a convenience sample (N=22) and a specially designed measure sensitive to this prototype and its codex-based content. While some ancient numbers are uncertain in their sources and were specifically noted as uncertain in this study, this might lower “exact number” accuracy without implying a lack of good source analysis. The task did not include measuring retention and transfer out-of-session.

Implications for design

Discovery and feedback (primary).

The codex layer should make new content obvious at the moment it becomes available and easy to find later. Improve discoverability through explicit “unlock” signalling during the first run (a brief highlight pass or guided tour), plus low-friction visual cues such as a subtle glow or badge on newly unlocked entries. When an entry unlocks, use a short toast notification that names what was added and why it matters (“New entry unlocked: *Praetor*—relevant to Galba’s decision”). Add lightweight navigation support (breadcrumbs and “related entries” links) so players can move from a character or event to the matching concept entry without losing context.

Concept scaffolding (secondary but high impact).

Several misunderstandings appear to cluster around Roman political vocabulary and chronology, so add compact supports that reduce cognitive load without simplifying the historical content. Introduce micro-cards for terms such as *imperium*, *provincia*, *praetor*, and *consul* that explain each concept in

plain language and provide a concrete example tied to the current episode. Where an entry depends on sequence (e.g., “what happened before/after”), include a mini timeline strip showing key dates/events in relation to the player’s current chapter. For geographically anchored content (e.g., Interamici), add a small locator map that shows “where this is” relative to familiar reference points.

Memory anchors and entry readability.

To help students retain what they read, make each entry visually and cognitively “sticky.” Display the 3D preview prominently as an anchor, then present information in a predictable left–centre–right layout. Add a short, named heading that forces synthesis—e.g., a “One-sentence takeaway”—so students can quickly recall the core meaning before returning to the story. This also supports revision: learners can skim takeaways to refresh key concepts without rereading entire entries.

Next steps.

The next phase should test whether these changes improve understanding beyond the immediate play session. Add a 1–2-week retention check to measure durable learning rather than short-term recognition. Instrument the codex with basic analytics to record which entries are unlocked but never opened, which are opened briefly, and which are revisited, then use these patterns to identify where players need stronger cues or clearer writing. Finally, revise the most challenging points (especially timeline reasoning and Roman offices) by improving explanations, examples, and navigation links, aiming for greater clarity without lowering disciplinary rigor.

5.7 Repository

The playable build and all author-written game scripts corresponding to the described architecture are available at https://github.com/Shrimpo22/Viriato-PoC. (release v1.0, accessed 26 Oct 2025).

For the reasons explained above, any referenced commercial content cannot be made available.

CHAPTER 6

Conclusion

This dissertation set out to design and investigate a historically informed and culturally localized game prototype that immerses players within Lusitanian history and complements gameplay with a Codex system.

Through the lens of two research questions: how historically themed games can support engagement and awareness, and what role culturally localized games might play in revitalizing national historical memory, a proof-of-concept game system using Unity was designed, visiting “Galba’s Massacre” scenario, designing a three-pane Codex system architecture, and conducting a qualitative assessment of the value of the system as a means of educational and experiential learning.

6.1 Summary of Approach and Artifact

Methodologically, the project blended Design Science Research with a Systematic Literature Review, allowing the work to be simultaneously artifact-driven and theory-aware. The DSR cycle—problem framing, design, demonstration, evaluation, communication—structured the prototype and its assessment, while the SLR situated claims in current evidence on game-based learning and digital heritage.

This was composed of the following: (i) a compact additive scene prototype made using Unity 6 (URP) to keep things technically feasible; (ii) a Codex with a database where the codex entries are stored and presented using a three-column UI with a preview stage and Orbit camera; and (iii) a simple unlock API that was accessed by world events and pickups. This was made to let everyone write without developing code and was also suited for diorama-style previews of complex entries like Interamici and Romans.

6.2 Evidence of Effect

The questionnaires involved a lightweight pre/post survey conducted before and after ~20-30 minutes of directed play. The questions targeted specific knowledge and self-perceived confidence regarding Codex subjects (ballista, onager, Interamici, praetor/Galba, gladius/falcata, Romans as a whole).

Overall scores for scored MCQs significantly increased from 24.1% (pre) to 70.9% (post) (N=22). The largest increases were in those tied to specifics supported through Codex, while those tied to historical sequencing and Latin for administrative offices were better but remained not high-ranking. Player self-assessed confidence increases are reflected in statements like “describe what Galba did and why it mattered” (1.8 to 3.7 rating points). The full instrument and all assessed items are provided in the Annex.

6.3 Contributions

Pedagogical. A just-in-time source of context that was voluntarily accessed by players after successful resolution of encounter-related activity supported a shift from simple recall to explanation and storytelling. This trial evidence points to the importance of a lightweight approach to scaffolding using short pages of information, cross-links between pages for additional context, and being able to manipulate a 3D preview.

Design/Technical. A data-driven architecture (entry assets + database + single unlock API) held strong for content development. A three-pane UI with a preview isolated from the camera ensured stable rendering and input handling. This pattern can be applied to other domains where objects, humans, and geographic locations would benefit from a text and model of representation.

Cultural. Through featuring a locus from the Portuguese culture (Interamici, Galba), the prototype demonstrated that culturally specific games can recreate marginalized storytelling patterns that relate to gamers' identities to supplement educational objectives.

6.4 Answering the Research Questions and Hypotheses

This dissertation aimed at addressing the following guiding questions: (RQ1) In what way can historically themed video games help to facilitate engagement with and understanding of history with younger learners? And (RQ2) How can culturally localized versions of those games help to maintain and restore the country's history?

Turning to RQ1, a positive response to this question can be derived from the literature review and results of the prototype study. This question asks to what extent can goal-oriented play with embedded history content facilitated by compact background information (the Codex) help participants achieve higher levels of knowledge acquisition and confidence to refer to history?

Hypotheses related to this question that knowledge acquisition and confidence levels could be enriched by means of a focus on history-narrative interaction and the judicious utilization of references at the right junctures have been satisfied by the behaviour of participants demonstrated in the prototype study. Participants did switch between playing actions and perusing the Codex without complication, did refer to the Codex for understanding strange history terms, and felt that history learning was facilitated by means of a symbiotic interplay between playing and Codex readings that enabled participants to 'lock in' new knowledge. Therefore, RQ1 can be answered affirmatively.

Regarding RQ2, the study shows, drawing on the expanding body of knowledge that validates game-based learning as a legitimate pedagogical method and a substantive means of engaging with cultures [3][4][5][10], that a culturally grounded design approach, using local toponyms, characters, and events, can help players relate new knowledge to a known place and sense of identity. Hypotheses related to RQ2, that a positive effect of localization would be to increase relevance, recall, and motivation, are supported by players' spontaneous mention of historical points of reference from Portuguese culture and their preference for the content that reflected known geography and culture. RQ2 is answered affirmatively: historically customized versions of video games can be powerful carriers of cultural memory not only by conveying information but by inserting it into a narrative that feels local and meaningful.

6.5 Large-scale vision to proof of concept

One of the key contributions of this dissertation is the concept for a big open-world historical action RPG (detailed further in chapter 4), which combines a Codex system that can be explored for knowledge discovery with historically valid narrative threads and an awareness of assessment for game progress. To assess the value of a concept without necessarily going into the expense of a full game project, the dissertation develops a proof of concept specifically for a single episode of this system.

And indeed, the prototype test has confirmed that the scaled concept can be built with current technology and that it's a positive learning concept as well. Test participants actively played the game without being encouraged to seek information from the Codex by themselves and achieved immediate learning gains without being guided to the specific items. This supports that a scaled version of the concept can further enhance learning gains by adding depth and breadth to learning.

6.6 Contributions of This Work

Methodologically, this dissertation combines a structured literature review with a design science paradigm for developing and assessing artifacts. In terms of substance, this dissertation contributes: a principled design for a big historical game that matches game mechanics to disciplinary thinking; a working prototype of which validates the main loop and knowledge supports; and a set of design guidelines for teams working at the intersection of game design, history education, and cultural heritage.

6.7 Dos and Don'ts of Designing Historical Learning Games

Drawing on the literature review and my own iterative design experience during development and classroom-oriented testing, I compiled the following dos and don'ts for designing historical learning games:

Do align mechanics with historian moves (sourcing, corroboration, contextualization, narrative construction).

Don't treat the game as a passive content wrapper detached from inquiry.

Do scaffold learning **before, during, and after** play (advance organizers, in-game prompts, brief post-play consolidation).

Don't assume that engagement alone produces learning.

Do provide a concise, linked **Codex** with previews, clear unlock signals, and tight coupling to what players are doing.

Don't bury critical context in long, unstructured text or hide when/why entries unlock.

Do localize content thoughtfully—names, places, artifacts—to activate prior knowledge and identity.

Don't rely on generic settings that dilute relevance and motivation.

Do make assessment lightweight and authentic (micro-checks tied to actions, reflection prompts, and observable choices).

Don't bolt on quizzes that interrupt flow or measure unrelated skills.

Do design for accessibility and equity (alternative inputs, adjustable pacing, offline-friendly materials).

Don't conflate controller mastery with historical thinking or require ideal classroom tech conditions.

Do signal uncertainty, sources, and historiographical debate inside the game world (e.g., "likely," "contested," provenance notes).

Don't let immersive presentation imply absolute certainty where evidence is partial.

Do apply trauma-aware framing when depicting violence or oppression (content notes, opt-outs, reflective debriefs).

Don't gamify harm without context or reflective boundaries.

Do respect data and privacy constraints for any companion services or telemetry.

Don't collect or retain learner data beyond what is necessary and ethical.

6.8 Limitations

This experiment keeps the focus quite narrow—one situation, brief learning exposure, convenience sampling, and short-term assessment. Knowledge was specific to the subject matter area and was assessed directly; long-term knowledge and generalization have not been assessed. Content mastery was circumscribed by scope (more controversial historiography, counter-interpretations), and so was accessibility variants and classroom integration. Last, UI bugs (unlocking discoverability; visibility for Codex novices) point to additional iterations needed.

Practically, the project proposes that knowledge system integration should be for play as secondary tools—to be entered into during natural breakpoints with short entries and tactile previews—not as stand-alone encyclopaedias. Regarding learning design materials and museums, the project proposes a format for a pattern—a lightweight database of entries with a neutral unlock API referencing world events and a preview camera space that indexes objects as evidence not as props.

Regarding the researcher's goal of developing theory with evidence, DSR + SLR + small-N qualitative assessment provides a replicable method of concept to evidence.

6.9 Closing Statement

Together, the review, the scaled-up design experiment in Chapter 4, and the proof-of-concept investigation illustrate that historically informed and culturally situated games can have a positive impact on engagement and historical knowledge when implemented with a thoughtful scaffolding strategy and a careful consideration of the parameters of proper behaviour.

This study's prototype has confirmed that the general idea has merit and can therefore answer the research questions and formally test the hypotheses. A scaled-up game can therefore be developed to fulfil the educational mission.

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Annex

Pre/Post Survey

Focus: knowledge players have BEFORE playing vs AFTER playing regarding specific topics in Codex (ballista, onager, Interamici, praetor/Galba, gladius/falcata, Romans). The same question is repeated to provide an answer for BEFORE and AFTER.

A. Questionnaire

Instructions. Each question will be answered twice. Once before playing and then after playing. If the player doesn't know he has the option to tick "Don't know".

A1. Multiple Choice Questions

1) Ballista — How does a ballista store energy?

□ A A laminated self-bow

□ B Twisted sinew cords wrapped in frames (torsion)

□ C Weighted counter arm like a trebuchet

□ D Gunpowder deflagration

□ E Don't know

Correct: B

2) Onager — Which measure best reduces the onager's violent recoil and frame walk-back?

□ A Seating the frame in an earth bed/ramped sod and shimming between shots

□ B Adding iron wheels so it can roll on release

□ C Tying the arm with a safety rope

□ D Hanging ballast weights from the spoon

□ E Don't know

Correct: A

3) Interamici — “Between which waters” did they live?

□ A Minho/Sil and Limia/Tâmega (NW Iberia)

□ B Tagus/Sado (Alentejo)

□ C Douro/Vouga (Beira Litoral)

□ D Mondego/Dão (Beira Alta)

□ E Don’t know

Correct: A

4) Praetor (Galba) — Which statement best describes a Roman praetor in the mid-Republic?

□ A A municipal treasurer without military powers

□ B A magistrate holding imperium who could command armies in a provincia and administer justice

□ C A priestly office responsible for games and omens

□ D An imperial governor appointed by the emperor

□ E Don’t know

Correct: B

5) Galba’s promise — Which sequence matches the sources about Galba’s action against the Lusitanians?

□ A Hostages exchanged → treaty renewed → escorted to new lands

□ B Groups separated on open ground with trenches → disarmed by trust → legionaries attacked; many killed or sold

□ C Night battle near a river ford with equal arms and terms

□ D Relocation to a colony with citizenship

□ E Don’t know

Correct: B

6) Consequences of the massacre — Which summary is most accurate?

□ A It pacified the region and ended raids within a year

□ B It ignited wider war and helped shape Viriato as a rebel leader opposing Rome

□ C It led to Galba’s execution in Rome and a permanent ban on settlements

□ D It had no effect beyond local resentment

□ E Don’t know

Correct: B

7) Falcata — Main use characteristic:

□ A Throwing spear

□ B Short, forward-curved single-edge sword for heavy cuts and close work

□ C Two-handed axe

□ D Lance

□ E Don’t know

Correct: B

8) Gladius — Typical technique behind the scutum:

□ A Wide sweep over the shield rim

□ B Short thrusts from behind the shield; cuts opportunistically

□ C Throwing the sword to disrupt lines

□ D Two-handed overhead blows

□ E Don’t know

Correct: B

9) Romans (SPQR) — What best sums up Rome’s statecraft in expansion?

□ A Hit-and-run raiding without infrastructure

□ B Roads/engineering, forts, law and logistics to make victories persistent

□ C Reliance on mercenaries alone

□ D Ritual war to avoid annexation

□ E Don’t know

Correct: B

10) Chronology:

□ A Ballista earlier; onager later

□ B Onager earlier; ballista later

□ C Both medieval inventions

□ D Both gunpowder devices

□ E Don’t know

Correct: A

11) Torsion upkeep — Wet weather tends to…

□ A Tighten sinew bundles, increasing range

□ B Slacken sinew; crews cover, oil it, and re-tension between shots

□ C Only affect wooden parts, not cords

□ D Have no effect

□ E Don’t know

Correct: B

12) Ballista bolts often had…

□ A Iron heads, sometimes square-section, with fletching

□ B Pure wood with feather only

□ C Explosive caps

□ D Don’t know

Correct: A

13) Onager battlefield role — Most typical tactical use under walls:

□ A Precision sniping of single officers

□ B Denying a gate mouth / breaking compact formations with high-arc stones

□ C Burning siege towers with flaming arrows

□ D Don’t know

Correct: B

14) Interamici evidence base mostly comes from…

□ A Interamici-authored chronicles

□ B Place-names, castro archaeology, and Roman inscriptions (e.g., Peoples’ Pillar)

□ C Medieval parish tithe rolls

□ D Don’t know

Correct: B

15) Roman citizenship trend over time:

□ A Contracted to fewer elites

□ B Expanded to provincials, culminating in broad grants

□ C Abolished in the 1st century BCE

□ D Don’t know

Correct: B

16) Legal-political aftermath — In Rome, Galba was…

□ A Condemned and executed by the Senate

□ B Prosecuted by a tribune; attacked by Cato; acquitted; later consul

□ C Exiled to Hispania permanently

□ D Tried by the emperor and forced to pay reparations

□ E Don’t know

Correct: B

17) Why the episode was scandalous in Roman terms — best reason:

□ A He lost a battle before negotiating

□ B He violated fides (good faith) by promising terms then attacking disarmed groups, harming Roman credibility

□ C He paid his troops late

□ D He used Iberian auxiliaries

□ E Don’t know

Correct: B

18) Praetor scope — Correct combination for a mid-Republican praetor in a province:

□ A No imperium, but full legislative power over Rome

□ B Holds imperium; can command troops and dispense justice within assigned provincia; subject to Senate oversight

□ C Religious official only; cannot judge cases

□ D Naval commander for life

□ E Don’t know

Correct: B

19) Source criticism — Our knowledge of numbers killed in the massacre is…

□ A Precisely established by a surviving Roman census

□ B Reported with wide variation by later authors; scale/treachery consistent, exact figures uncertain

□ C From a Lusitanian diary written on the day

□ D Don’t know

Correct: B

20) Terminology pair — Match imperium and provincia:

□ A imperium = priestly augury; provincia = city tax office

□ B imperium = lawful command authority; provincia = sphere/territory where that command is exercised

□ C imperium = citizenship; provincia = a colony founded by citizens

□ D Don’t know

Correct: B

21) Praetor vs consul — In the mid-Republic…

□ A Praetors outranked consuls and could overrule them in war

□ B Consuls typically outranked praetors; praetors often governed provinces or served as judicial magistrates

□ C Offices were identical; names varied by region

□ D Don’t know

Correct: B

A2. Perception and Confidence

Use a 5-point scale: 1 Not at all · 2 A little · 3 Somewhat · 4 Mostly · 5 Fully.

22) I can explain what Galba did and why it mattered.

23) I can situate ballista vs onager in role and timeline.

24) I can identify the Interamici and explain the name.

25) I can cite one concrete detail (weapon, office, or practice) to support a historical claim.

A3. Short Free Response

26) In one or two sentences, describe how a ballista works.

27) In one or two sentences, describe what triggered Viriato's rebellion.

Marking notes. Items 1–21= right/wrong. Items 26 and 27 use a 0/1 rubric (clear, specific, correct = 1). Items 22–25 are self-ratings.

B. Results

Sample. N = 22; single short session. Items 1–21 scored 0/1. Items 26 and 27 rubric 0/1. Items 22–25 are self-ratings.

B1. Percent correct by item (scored MCQ)

Item	Topic (short)	% BEFORE (n/22)	% AFTER (n/22)
1	Ballista = torsion	27.3% (6)	86.4% (19)
2	Onager: earth bed/shims	18.2% (4)	68.2% (15)
3	Interamici: "between waters"	9.1% (2)	59.1% (13)
4	Praetor = imperium; command & justice	31.8% (7)	72.7% (16)
5	Galba's sequence (promise → division → attack)	36.4% (8)	81.8% (18)
6	Consequence: Viriathus's rebellion	22.7% (5)	68.2% (15)
7	Falcata = forward-curved cutter	40.9% (9)	81.8% (18)
8	Gladius = thrust behind scutum	45.5% (10)	86.4% (19)
9	Rome = roads/law/logistics	68.2% (15)	86.4% (19)
10	Chronology: ballista → onager	13.6% (3)	59.1% (13)
11	Wet slackens sinew; cover/oil/re-tension	13.6% (3)	63.6% (14)
12	Ballista bolts (iron, often square-section)	9.1% (2)	68.2% (15)
13	Onager role: deny gates/disrupt blocks	13.6% (3)	72.7% (16)
14	Interamici evidence (toponyms, castros, inscription)	9.1% (2)	63.6% (14)

15	Citizenship trend: expansion	40.9% (9)	77.3% (17)
16	Galba in Rome: prosecuted, absolved; later consul	9.1% (2)	63.6% (14)
17	Scandal: breach of trust	9.1% (2)	68.2% (15)
18	Praetor scope: *imperium* in *provincia*, justice	13.6% (3)	68.2% (15)
19	Numbers uncertain; scale/treachery consistent	4.5% (1)	63.6% (14)
20	Match: *imperium* = command; *provincia* = sphere	4.5% (1)	68.2% (15)
21	Rank: consuls > praetors (typical)	18.2% (4)	63.6% (14)

B1b. Rubric-scored items (0/1)

Item	Prompt	% BEFORE (n/22)	% AFTER (n/22)
26	Explain briefly how a ballista works	40.9% (9)	81.8% (18)
27	What triggered Viriato's rebellion	13.6% (3)	63.6% (14)

B2. Perception/Confidence

Item	Prompt	Mean BEFORE	Mean AFTER
22	Explain what Galba did and why it mattered	1.8	3.8
23	Situate ballista vs onager (role/timeline)	1.5	3.4
24	Identify Interamici & name meaning	1.3	3.0
25	Cite one concrete detail to support a claim	2.1	3.8