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Designing Knowledge to Be Traversed: Analyzing Revision Histories in a Co-Designed Minecraft Education World

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Abstract: This qualitative case study examines Cicerone sulle tracce di Ulisse, a historical-philosophical Minecraft Education game co-designed by 40 lower-secondary students from six classes. The game connects Cicero's assassination, the Odyssey, and the Riviera di Ulisse through a traversable narrative. Four episodes illustrate how cultural content was designed as places, characters, and player actions. The primary corpus includes 39 dated states in six retrospectively selected sequences, yielding 33 successive comparisons: 11 progressions, 13 mixed reworkings, and 9 revisions. An additional 75 screenshots expand the record without independently validating coding. Archived states show additions and reconfiguration of existing arrangements. According to the coordinator's first-hand retrospective account, students and teachers discussed problems and agreed changes within a guided co-design process. The study distinguishes visible transformations, reported explanations, and individual learning outcomes that were not measured.

Keywords: digital storytelling; narrative meaning-making; Minecraft Education; guided co-design; artifact revision

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1. Introduction

During the 2025–2026 school year, 40 students from six lower-secondary classes developed Cicerone sulle tracce di Ulisse [Cicero on the Trail of Ulysses], a historical-philosophical mystery game in Minecraft Education. The player investigates Cicero's assassination while exploring a continuous representation of the Riviera di Ulisse in southern Lazio, where coastal routes and monuments organize journeys, encounters, and clues rather than merely providing scenery. The clues contribute to the Young Citizen's Handbook, a fictional synthesis of Cicero's civic ideas.

The completed game does not, however, reveal how its configuration was reached: archived states preserve evidence of additions, alterations, and replacements of earlier solutions. This study examines both the cultural meanings designed into the game and the evolution of its spatial configurations.

Research on game making and participatory design offers perspectives on collaborative production (Druin, 2002; Kafai & Burke, 2015). Within learning design, Muñoz-Cristóbal et al. (2018) point to limited attention to how artifacts evolve during design processes. This study adopts that perspective by examining successive versions of a student co-designed narrative world.

The study distinguishes two complementary analytical levels. Four episodes illustrate how cultural sources were turned into playable situations. The principal empirical analysis examines spatial versions through two research questions: (RQ1)

What forms of spatial change are observable across successive versions of the co-designed Minecraft Education world? (RQ2) Which changes reconfigure existing arrangements, and what sources support the reported explanations? Both levels concern the same narrative environment but rely on different evidence.

2. Theoretical and pedagogical frame

Meaning-making here denotes the design of situated cultural interpretations: historical and mythological content becomes places, dialogue, clues, and actions. The Roman Cistern in Formia, for example, frames an inquiry into water as a common good. Digital storytelling (Robin, 2008), narrative theory (Bruner, 1991), and spatial storytelling (Jenkins, 2004) inform the interpretation of these designed meanings.

Constructionist game making makes ideas visible and revisable (Kafai & Burke, 2015). Collaborative Minecraft design involves differentiated roles (Hewett et al., 2020), while participatory design recognizes children as design partners (Druin, 2002). External representations may support formulating and comparing ideas (de Vries, 2006). Reflective practice treats revision as a dialogue with the design situation (Schön, 1983); research on evolving learning-design artifacts offers tools for describing successive states (Muñoz-Cristóbal et al., 2018). Visible changes to an artifact do not directly measure individual learning; observed behavioral engagement likewise differs from cognitive and emotional engagement (Fredricks et al., 2004).

3. Materials and Methods

3.1. Educational context and completed artifact

This extracurricular project ran mainly online from December 2025 to March 2026 for the national contest "La Riviera di Ulisse in Minecraft" (Maker Camp, n.d.). The final product was an explorable narrative game integrating an investigative route, characters, dialogue, and programmed interactions within one Minecraft world. Of the 40 participants, 21 chiefly built the world; others focused on research and scripts, with overlapping roles. The author (hereafter, the coordinator) coordinated and facilitated the project with colleagues in Art, Italian, History, and Geography. Students studied sources, wrote dialogue, modeled places, programmed interactions, tested the game, and collaborated with peers.

Historical and archaeological sources, maps, photographs, and aerial views, also consulted through Google Earth, informed spatial interpretation. During game development, the coordinator used ChatGPT (OpenAI) to explore sources and narrative options and suggest building changes, including annotations or proposed edits to world screenshots. The coordinator also used ChatGPT and Canva to produce provisional visual references. These materials were discussed with students rather than treated as validated reconstructions or models to copy; proposals were assessed against historical, architectural, and narrative criteria. A continuous world without teleportation made geography, scale, site recognizability, and travel time shared design constraints.

3.2. Iterative design revision

According to the coordinator's account, students and teachers identified problems by studying sources and observing the world together, discussed alternatives, and agreed revisions, including substantial territorial redesigns. For complex interventions, the coordinator contributed architectural and technical expertise, using Minecraft structure blocks to copy or move sections of the world.

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3.3. Complementary evidence: narrative documentation and world histories

The author analyzed the project retrospectively after participating as coordinator: this position affords first-hand testimony but may introduce recall and involvement bias. Sources include reports, scripts, dialogue, programmed interactions, and the submitted game. Four narrative episodes were examined in terms of cultural reference, spatial setting, actions, and intended meaning; this analysis remained separate from spatial coding. Exchanges occurred in person and through Google Classroom: selected messages of 6–14 March, recovered later, document feedback and assessments of AI suggestions, but not the complete decision history. Figures show only the virtual world; no identifiable student messages are reproduced.

For the retrospective analysis, six image sequences were selected with AI-assisted organizational support from available screenshots. The practical criterion was repeated, dated viewpoints allowing successive comparisons in recognizable territorial sectors; selection was neither representative nor a ranking of the most significant transformations. The sequences—Villa di Mamurra, Formia from the sea, Monte Orlando–Via Flacca, Circeo–Terracina–Sperlonga, Garigliano–Minturnae, and a Sperlonga close-up—include 39 states dated between 20 January and 20 March 2026, yielding 33 comparisons. They do not exhaust the project's backups; further sequences might reveal other transformations. Intervals and framings vary, and some views overlap. A supplementary collection comprises 75 screenshots in seven views (68 comparisons) partly overlapping the primary corpus.

3.4. Coding and evidential provenance

The unit of analysis is the comparison of two successive artifact states, not an individual participant's action. Categories are progression (addition preserving the existing arrangement), mixed reworking (addition accompanied by modification of existing parts), and revision (removal, relocation, replacement, or reconfiguration). Examples include new structures, extensions with local changes, and removal of provisional volumes at Sperlonga. Criteria concern visible operations, not their magnitude or assumed cause. Where comparisons contain different operations, the assigned category summarizes the observable pattern, not the amount of work performed. Reported rationales were coded separately by source: A (direct contemporaneous trace), B (project documentation), C (coordinator's retrospective account), D (no recorded rationale), C-low (uncertain recall), and B/C (mixed support). Codes do not identify decision-makers.

The author coded the 33 primary comparisons without an independent second coder. Classroom messages retrieved later were used to contextualize the analysis but did not change codes in the absence of direct links to specific comparisons. Counts from an earlier ChatGPT-assisted analysis (OpenAI), not independently validated, were excluded.

4. Results

4.1. From historical inquiry to a playable historical-philosophical mystery

The game opens in Formia with Cicero's assassination in 43 BCE. A Via Appia scene and an encounter with his secretary Tiro initiate a fictional investigation into the killing and questions of civic responsibility (Figure 1). The player follows clues across narrative settings rather than visiting monuments in chronological order.

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Documented Roman sites, subsequent archaeological interpretations, Homeric motifs, and invented encounters perform different narrative functions. The continuous coastal route connects Cicero's historical context to the mythic journey and a civic conclusion, giving cultural references a shared narrative and spatial structure.



Figure 1. Two moments of the implemented opening: (A) Cicero's assassination represented along the Via Appia and (B) an encounter with Tiro in the Roman villa. Screenshots document narrative settings; dialogue and player actions are described in the project scripts.

4.2. Four situated episodes of meaning-making

The four episodes illustrate the first analytical level: different cultural references became playable situations tied to specific places. They exemplify conditional access, a route diversion, dialogue with an acknowledged anachronism, and a final synthesis. They document intended meanings, not how players received them.

Listening and the common good: the Forum of Witnesses and the Roman Cistern. Four freedmen offer conflicting testimonies about Cicero's death, and the player can enter the Cistern only after listening to the sequence. Inside, the player seeks a clue concerning water as a common good. The Roman hydraulic site thus becomes both a setting for investigation and an occasion for civic interpretation. Listening is a programmed condition for progress; it does not itself verify understanding.

Mythic travel: 'Nobody' and the threshold of the journey. When a section of the Via Appia is blocked, a character named 'Nobody' directs the player toward the sea. The Homeric allusion to Odysseus' assumed name becomes an actual detour, connecting the inquiry into Cicero to the mythic journey.

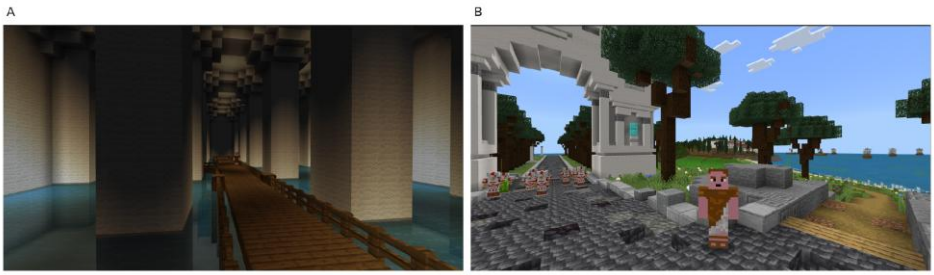


Figure 2. Situated narrative sites: (A) the Roman cistern, where the player searches for a clue about the common good; (B) "Nobody" near a redirected coastal route, an Odyssean allusion embedded in spatial movement. Original game views; the action logic is documented in project scripts.

Historical encounter: the Grotto of Tiberius at Sperlonga. The player meets a fictionalized Tiberius who acknowledges living after Cicero's time. The dialogue evokes

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sculptural groups representing episodes from the Odyssey and addresses virtue, reason, power, and choice while distinguishing chronology, archaeological context, and fiction.

Civic synthesis: return and the Young Citizen's Handbook. At the end of the journey, the player returns to the opening context of the investigation and assembles notes gathered on virtue, duty, eloquence, reason, and society. The resulting handbook synthesizes the civic themes encountered through places, dialogue, and actions.

4.3. Cases of spatial transformation in the represented territory

Table 1. Four territorial cases, distinct from the four narrative episodes of Section 4.2. The second column reports design issues and shared responses as reconstructed by the participating coordinator; the third records transformations visible in dated states.

Territorial case	Design issues and shared response (coordinator's account)	Visible spatial change
Terracina–Circeo	Terracina was present along the coastal route from the outset, but its headland was small and understated. Joint inquiry highlighted the sanctuary traditionally known as the Temple of Jupiter Anxur, which had not initially been considered or sufficiently assessed. The group agreed to enlarge Terracina and provide more space between it and Circeo.	Enlargement and reshaping of the Terracina headland; lateral shift of the Circeo sector and altered distances between coastal landmarks.
Sperlonga	The initial arrangement reproduced the present-day hilltop settlement in a Roman-period setting. Further joint research identified the anachronism and the presence of villas nearer the lower coast; the group agreed to revise the layout.	Removal or relocation of provisional hilltop building volumes; altered spatial relationship with the lower coastal area.
Minturnae–Garigliano	Research into monuments and the narrative route prompted discussion of the area's extent and the river landscape.	Extension of the represented territory and integration of river landscape features.
Villa di Mamurra–Gianola	Comparison between surviving ruins and the ancient maritime complex traditionally attributed to Mamurra prompted reconsideration of position, axes, and access.	Initial relocation of the villa and road changes, followed by extension of the complex.

The institutional sources used to contextualize the locations are Città di Terracina (2019), Comune di Sperlonga (2025), and Ente Parco Regionale Riviera di Ulisse (n.d.). The reported design rationales in Table 1 instead derive from the coordinator's retrospective account.

4.4. Longitudinal evidence of progression, reworking, and revision

The 33 primary comparisons comprise 11 progressions, 13 mixed reworkings, and 9 revisions. Twenty-two comparisons also document changes to existing arrangements: the sequences record reconfiguration alongside additions, without establishing which type prevailed across the entire world. Table 2 distinguishes visible change from the provenance of its explanation.

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Table 2. Categories of visible change and provenance of reported rationales in the 33 primary comparisons. No comparison has standalone A-level support; B appears only in mixed form (B/C). C-low marks uncertain retrospective reconstruction.

Change category	Total	D	C	C-low	B/C
Progression	11	10	1	0	0
Mixed reworking	13	7	6	0	0
Revision	9	0	7	1	1
Total	33	17	14	1	1

The 75 supplementary screenshots allow 68 descriptive comparisons, partly overlapping the primary corpus. Ambiguous differences in colors or water surfaces were not coded as spatial reconfigurations. These comparisons were neither merged with the main matrix nor treated as independent validation.

In the territorial cases of Table 1, dated states show spatial transformations but do not independently establish their rationales. Figure 3 illustrates a Sperlonga revision by comparing two successive states.



Figure 3. Sperlonga, frontal views of archived world states: (A) 13 March and (B) 18 March 2026. Provisional hilltop building volumes visible in the first image are no longer present in the same configuration in the second; the coastal settlement and surrounding terrain have also been reorganized.

The Monte Orlando–Via Flacca sequence includes seven comparisons between eight dated states (three revisions, three mixed reworkings, and one progression). Images show changes to coastal profiles, terrain projections, and land–water relationships without independently determining causes. Other views document territorial expansion and additional landscaping around Minturnae–Garigliano. An archive change does not necessarily correspond to a new narrative scene.

The presence of reported rationales differs by category: all 9 revisions have an accompanying explanation, compared with 6 of 13 mixed reworkings and 1 of 11 progressions. More conspicuous changes may be easier to recall, or revisions may have prompted more explicit discussion; neither interpretation is independently verified. Classroom messages provide partial context: on 6 March, the coordinator shared AI suggestions for the Formia harbor and recommended consulting the Art teacher. The views of 5 and 13 March do not establish which suggestions, if any, were adopted. A 14 March message about Gianola cannot be unambiguously linked to subsequent changes.

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5. Discussion

5.1. Responses to the research questions and narrative meaning

The two research questions are addressed through the documented transformations. For RQ1, sequences show additions, extensions, relocations, and spatial reconfigurations. For RQ2, 22 of 33 comparisons also affect existing arrangements: development was not merely cumulative. However, evidential support for explanations is uneven: Table 2 shows no comparisons linked to direct contemporaneous A-level traces, while many rationales remain unrecorded or rely on the coordinator's retrospective testimony.

The relationship between cultural meanings and spatial revision is apparent especially at Terracina and Sperlonga. The coordinator connects these changes to shared historical inquiry, while the images document interventions without independently confirming their causes. At Sperlonga, the redesigned territory also contains the Grotto of Tiberius episode described in Section 4.2. The same place can therefore be examined for its designed meanings and for its transformation during production. This reading relates to spatial storytelling (Jenkins, 2004), reflective practice (Schön, 1983), and the study of evolving design artifacts (Muñoz-Cristóbal et al., 2018), without measuring individual learning.

5.2. Guided co-design, agency within constraints, and engagement

The process described in the methods may be interpreted as guided co-design. According to the coordinator, students and teachers discussed problems and agreed solutions despite differing responsibilities and expertise. The coordinator's technical support, especially for complex interventions, makes a role asymmetry explicit without necessarily negating students' participation. This arrangement relates to participatory design (Druin, 2002) and differentiated roles in Minecraft game making (Hewett et al., 2020). World continuity, scale, travel times, and historical and narrative criteria provided shared constraints within which alternatives were debated. ChatGPT and Canva supported teacher-mediated proposals; Classroom messages partially document their discussion but cannot establish that particular proposals caused specific world changes.

The coordinator informally observed persistent voluntary participation by some students, including evening work and repeated attempts to solve problems. These observations concern behavioral engagement (Fredricks et al., 2004), not systematic measurement of cognitive or emotional dimensions.

5.3. What the paired evidence contributes

Sources contribute differently to the reconstruction: dated states show spatial changes, narrative documentation records designed cultural meanings, Classroom messages capture selected feedback, and the coordinator's testimony contextualizes certain decisions. No source alone reconstructs the entire process. The methodological contribution lies in comparing successive artifact states while coding the provenance of explanations separately. This distinction describes visible transformations without automatically attributing intentions, decisions, or learning outcomes to participants. The descriptive procedure remains exploratory and requires further reliability and transferability testing.

5.4. Scope and limitations

This retrospective single case concerns a voluntary extracurricular contest project and relies on the participating coordinator's testimony, which may be affected by recall and involvement bias. Six sequences were selected with AI-assisted organizational support from available comparable views rather than a representative sample; overlapping viewpoints and irregular intervals limit interpretation. The supplementary corpus is not independent, and Classroom messages capture only selected feedback. One researcher coded the changes without independent reliability testing. The analysis cannot attribute individual contributions, measure learning, or infer how players interpreted the designed meanings. Figures show virtual environments without identifying students or messages. Backups and the coding matrix are not public; access and reuse remain subject to school permissions and data-protection safeguards.

6. Conclusions

Cicerone sulle tracce di Ulisse is a case of collaborative design in which historical, mythological, and civic content became an explorable narrative game. Archived states show that the world developed through additions as well as reconfiguration of previously built arrangements.

The study's contribution is to examine cultural meanings designed into the game alongside documented spatial transformations, while distinguishing first-hand retrospective accounts of decisions from directly observable changes. Findings describe artifact evolution without establishing individual learning effects. Concise decision logs alongside backups could preserve rationales that retrospective reconstruction recovers only partially. Further cases and independent coders are needed to assess the procedure's reliability and transferability.

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