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# The Role of AI in Historical Simulation Design: A TPACK Perspective on a French Revolution Simulation Design Experience

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**Abstract:** This study explores the integration of generative artificial intelligence (GenAI), specifically ChatGPT, in designing a historical simulation of the French Revolution for eighth-grade students. Using the technological pedagogical content knowledge (TPACK) framework, the research examines how GenAI facilitated and obstructed the creation of an immersive educational experience, addressing the challenges and opportunities it presents. The study employs an explanatory case study methodology combined with autoethnographic elements, capturing the dynamic interplay between AI tools and educators in the design process. The simulation incorporated faction-based role-playing to engage students in historical decision-making, influenced by both pre-revolutionary and revolutionary events. GenAI played multiple collegial roles in the design process, including as a subject matter expert, game mechanics designer, and content communicator, enhancing efficiency and creativity. However, its limitations—such as unverified information, anachronisms, and biases—necessitated careful consideration, drawing on content matter expertise and knowledge of curriculum and class context. Findings indicate that the effective use of GenAI to assist simulation design requires a robust integration of content knowledge, technological proficiency, and pedagogical strategies within the TPACK framework. The study contributes to emerging research on AI's role in pedagogical design process, with implications for history education and beyond.

**Keywords:** history education; historical simulations; generative AI; role-playing simulations; TPACK; simulation design



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## 1. Introduction

In this article, I examine and evaluate how generative AI (GenAI) tools such as ChatGPT may assist in designing a historical simulation focused on the French Revolution. In this article, GenAI refers to a type of AI that can create new content—such as text, images, music, or code—by learning patterns from existing data and generating outputs that resemble human-created work. Examples of GenAI tools include ChatGPT; this study specifically refers to version GPT-4.

### *1.1. Simulation-Based and Active Learning*

Traditional instructional approaches often fail to resonate with students' lived experiences (White et al., 2006; Petousi et al., 2022). Simulation-based learning offers a compelling alternative, immersing students in historical inquiry (Owen & Irion-Groth, 2020; Halverson et al., 2024). This method positions students as active participants in constructing historical knowledge (Vlachopoulos & Makri, 2017). Multiple studies indicate that active learning through simulations enhances students' conceptual understanding (e.g., Carlos et al., 2023; Glazier, 2011; Jones & Bursens, 2015). Despite variations in design, simulations share a focus on role-based intergroup and whole-class discussions surrounding a historically situated problem, with developments and outcomes influenced by students' decisions (Shaw, 2017; Wright-Maley, 2015). Thus, a simulation serves as a model that mimics a historical phenomenon so that learners, through "what-if" scenarios, can explore its elements, causes, and consequences (Lean et al., 2006).

### *1.2. Simulation Design and Generative AI*

While there are commercially available simulations (e.g., Winardy & Septiana, 2023), simulation design is not necessarily a costly procedure. Instead, success depends on embedding curriculum-relevant learning objectives within a structured game framework (Arnold, 1998). Traditionally, the design of simulations—a critical factor in their effectiveness—has often fallen to individual teachers (Monahan, 2002). With the emergence of GenAI, these individuals have been provided with tools that hold "immense potential" (Fui-Hoon Nah et al., 2023, p. 296) for simulation-based pedagogies (Vaughn et al., 2024). Within history education, studies have assessed GenAI's effectiveness in generating simulation design ideas (Carrasco Rodríguez, 2023) and in supporting conversational role-playing scenarios (Share & Pender, 2024; Stampfl et al., 2024).

Studies conducted prior to the advent of widely available GenAI tools emphasize that successful technology use in educational design hinges on the integration of technological know-how, pedagogical strategies, and content knowledge (Ciriza-Mendívil et al., 2022; Koehler & Mishra, 2009; Yılmaz, 2021). In the age of ChatGPT, where humans and machines increasingly collaborate as virtual colleagues (Meron & Araci, 2023), examining this integration becomes even more critical for understanding how human–AI interactions shape educational design (Kalantzis & Cope, 2025; Mishra et al., 2023; Peters et al., 2024). Specifically, given the complexity of the historical simulation design process, it is important to examine how teachers may navigate it in the age of generative artificial intelligence (Chang et al., 2025).

Addressing this need, the present study explores my experiences of GenAI-assisted design and development of a simulation focusing on the French Revolution. To understand the intersection of technology and pedagogy, I examine how GenAI functioned as a virtual colleague in the design of a historical simulation and how its affordances and constraints were negotiated. Specifically, the research addresses the following questions:

1. What characterized generative AI's role in the design of a historical simulation?
2. What characterized the negotiation of affordances and constraints associated with these roles?

## 2. Literature Review and the TPACK Framework

Recent studies have examined GenAI's role in simulation-based history instruction. For instance, Hutson et al. (2024) utilized ChatGPT to simulate historical characters in order to enhance student engagement, while Tirado-Olivares et al. (2023) explored its use as a conversational agent to support students' historical reasoning. Similarly, Dai et al. (2024) examined AI-powered simulations in which students interact with virtual agents. While these studies indicate that GenAI-powered pedagogies can significantly enhance student learning, the present study shifts the focus to educators' involvement with GenAI in the *design* of historical simulations. This area remains relatively underexplored (Flaherty, 2023) with the exception of Carrasco Rodríguez (2023), who evaluated an AI-generated historical role-playing simulation. The study found that while ChatGPT (version 3.0), in an imagined scenario, could construct simulated historical events, it was limited by historical inaccuracies. Building on this research, the present study specifically investigates affordances and constraints of human–machine interaction in the design of simulations in history classrooms.

Carrasco Rodriguez' evaluation suggests a critical role for teachers in integrating historical simulations into learning processes. The ability of teachers to plan, enact, and evaluate such processes is commonly conceptualized as *pedagogical content knowledge* (PCK) (Wilson et al., 2018; Nordine et al., 2021), derived from Shulman's (1986) seminal work. The integration of digital tools into teaching practices has spurred the conceptual development of PCK into *technological pedagogical content knowledge* (TPACK; Mishra & Koehler, 2006). The TPACK framework (see Figure 1) delineates the essential knowledge educators need to effectively integrate technology into their teaching practices (Mishra & Koehler, 2006; Koehler & Mishra, 2009).

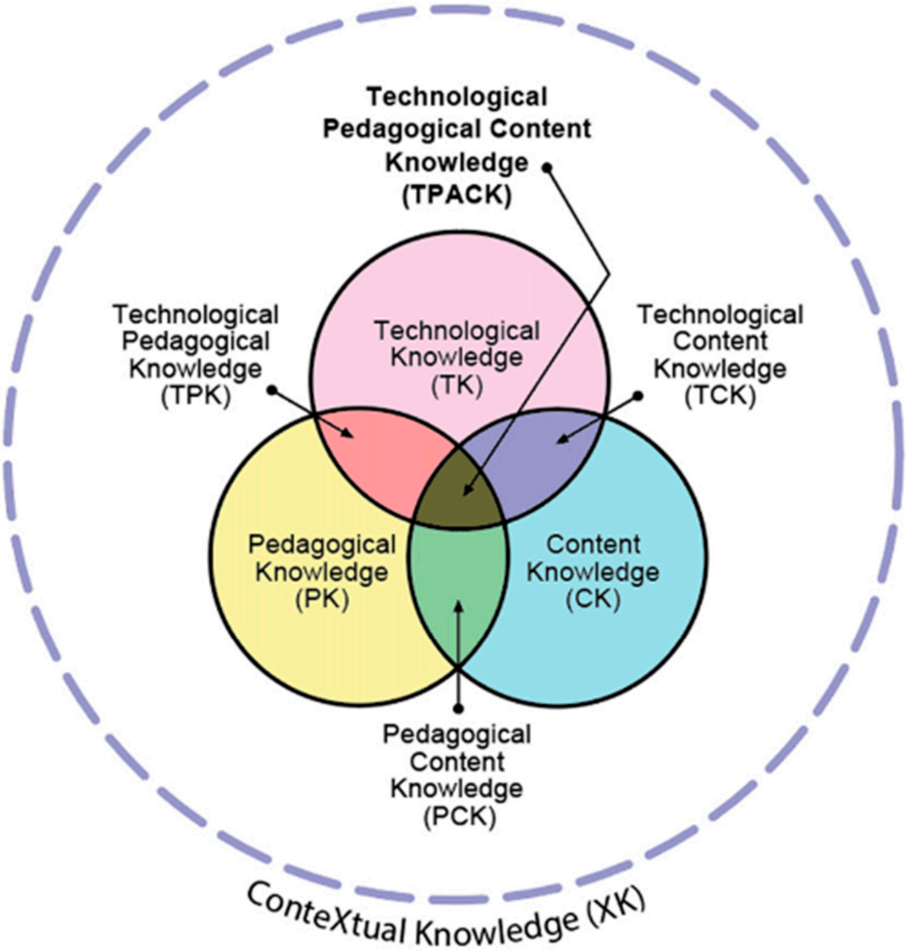


**Figure 1.** The TPACK model (Koehler & Mishra, 2009; Mishra, 2019).

In this study, I adopt TPACK as both a theoretical and an interpretive lens to examine my GenAI-assisted historical simulation process. Below, I provide an overview of the TPACK elements as described by Mishra and Koehler (2006).

*Pedagogical content knowledge* (see Figure 1) is, as mentioned, derived from Shulman's (1986) framework. Central to PCK is the concept of transforming one's knowledge of the subject matter (i.e., content *knowledge*, CK) to make it teachable. This transformation involves the teacher interpreting the subject matter, recognizing common misconceptions held by students, devising diverse presentation methods, and modifying instructional materials to address students' prior knowledge and alternative perspectives. *Technological knowledge* (TK) involves a broad understanding of information technology in both professional and personal settings, and the adaptability to keep pace with technological changes. While TK is a form of general understanding, *technological content knowledge* (TCK) is more specifically geared towards the presentation of specific content. It includes the ability to select appropriate technological tools for presenting certain types of content, since "the choice of technologies affords and constrains the types of content ideas that can be taught" (Koehler & Mishra, 2009, p. 65). *Technological pedagogical knowledge* (TPK) extends beyond content presentation to an understanding of how teaching and learning processes interplay with particular technologies. It includes recognizing the pedagogical affordances and constraints of technologies and adapting one's pedagogical design to navigate these strengths and limitations. Contextual knowledge (XK) represents knowledge about the specific classroom, school, and system contexts into which technology is integrated (Mishra, 2019).

Lastly, *Technological, Pedagogical, and Content Knowledge* (TPACK)—the framework's integrative center—emphasizes the application of pedagogical techniques to represent concepts, address misconceptions, and enhance learning using technology. Teachers' TPACK evolves with experience and training in situated practices. In my study, it serves as a conceptual framework for understanding GenAI's affordances and constraints in the design process.

## 3. Methodology

In this research, I employed an autoethnographic methodology (Chang et al., 2016). Utilizing a self-study approach (Hamilton et al., 2008), I conducted an explanatory case study (Yin, 2014) in the dual capacity of teacher and researcher. Explanatory case studies aim to provide in-depth descriptions while exploring, analyzing, and establishing cause-and-effect relationships within the case (Freebody, 2003). In this study, the case is the AI-assisted design of educational historical simulations. Given its close-to-practice perspective, I initially considered framing it as action research (Kemmis et al., 2014) rather than a case study. However, action research typically aims to systematically improve instruction, whereas this study is primarily exploratory.

The self-study approach entails that the researcher takes "a look at self in action" (Hamilton et al., 2008, p. 17). A key strength of this approach is that it enables the researcher to validate their own experiences within educational settings, recognizing the explanatory potential of these first-hand involvements (LaBoskey, 2004). Its validity primarily resides in trustworthiness, which sets it apart from approaches that are more reliant on pre-defined or intersubjectively defined procedures. While the approach recognizes "the richness of the subjectivity" (Tidwell & Fitzgerald, 2004, p. 82), there is an inherent risk of biased subjectivism. To mitigate this risk, I employed data triangulation (Bryman et al., 2022), a strategy commonly applied in self-study research (LaBoskey, 2004). To that end, I compared insights across multiple forms of data (ChatGPT interaction transcripts, classroom recordings, field notes, etc.) to identify consistent patterns and anomalies, drawing on researcher reflexivity (Braun & Clarke, 2019). In recognition of the reflexivity inherent in the methodology, I use the first-person pronoun consistently throughout the article.

### *3.1. Case Study Context: The French Revolution Simulation*

The study was conducted prior to and during a six-week instructional unit in school history, taught in three eighth-grade classes at a Swedish public school. A total of 58 students (14–15 years of age), one pre-service teacher, and two teachers (including myself) participated in the simulation, the design of which is focused on in the study. For context, the unit covered the Industrial Revolution, the Enlightenment, and the French Revolution. The first three weeks followed a traditional teaching format, including lectures and textbook readings, to provide students with foundational knowledge about 18th-century

European economic and political developments. During this time, the students were taught by their regular teacher (pseudonym: Mary), while I focused on designing a subsequent simulation focused on the French Revolution. The simulation was based on Arnold's (1998) principles, which emphasize inclusivity, historical accuracy, decision-making freedom, and strategically simplified explanatory frameworks. The design process involved ongoing discussions with Mary and adjustments to align with the unit's objectives. The final three weeks of the unit centered on the historical simulation.

The simulation aimed to deepen students' understanding of the French Revolution's complex political context by simulating pre-revolutionary power struggles. Students were divided into factions reflecting the socio-economic and political diversity of 18th-century France, including estates (clergy, nobility, and commoners), socioeconomic status (rich/poor), ideology (conservative, liberal, radical), and demographics (urban/rural). For example, the nobility was split into "high" and "low" groups. Within each faction, students were assigned individual roles represented by illustrated character cards detailing their character's name, age, occupation, and residence.

These characters belonged to one of eight "factions", each with 3–4 students. The simulation was organized through event-based tasks across multiple "turns", each spanning 1–2 lessons. The first turn, set during the Seven Years' War (1756–1763), tasked students with debating whether France would get involved in the conflict. Ensuing events dealt with Enlightenment ideas, land reforms, and convening the Estates General. Each faction advocated for decisions aligned with their objectives, attempting to persuade "the King" (played by the teacher).

Points were awarded to factions based on the quality and persuasiveness of their arguments. Factions that gained politically from the king's ultimate decision earned additional positive points, while others incurred negative points. Additionally, groups received "cooperation points" based on their effectiveness in working together. The political and economic state of "France" was reflected in a separate scoring dependent on political developments, with a central premise that reaching zero would trigger a national uprising—the French Revolution.

### *3.2. Data*

Key data for the study include digitally documented interactions between me and ChatGPT during the design phase (December 2023 to April 2024), which preceded the implementation phase (15 May to 31 May 2024). These mainly text-based interactions consist of approximately 19,000 words (saved in Word documents) and 43 images (saved in JPEG format). Additional data—used to triangulate findings from the design phase—came from audio recordings of student and teacher classroom interactions and students' documents during the implementation phase. Finally, field notes from the implementation phase (approximately 2700 words) provided further insights.

### *3.3. Ethical Considerations*

The study was approved by the Swedish Research Ethics Committee (diary no. 2024-00405-01) and conducted in accordance with the committee's ethical guidelines (Swedish Research Council, 2024). Students and their guardians were informed about the study's purpose and procedures, emphasizing that participation was voluntary and could be withdrawn at any time without consequences. All data were anonymized to protect confidentiality and minimize potential risks. Data involving students were mainly used for data triangulation when I reflected on design experiences in light of the simulation's implementation.

### 3.4. Analysis

I conducted a qualitative content analysis (Graneheim & Lundman, 2004) to interpret patterns of interaction between myself, generative AI tools, and in some instances, students. This iterative process began with identifying meaning units—instances of GenAI interaction—which were then descriptively coded (e.g., "ChatGPT helps with images"). These codes were progressively abstracted into sub-themes, themes, and overarching themes, moving from descriptive observations to interpretive insights (Lindgren et al., 2020).

One overarching theme that emerged was generative AI's *collegial role*. This "anthropocentric" theme, reinforced by ChatGPT's communicative chat-based interface, enabled me to further thematize the GenAI tool as a *virtual colleague* (Meron & Araci, 2023), fulfilling various professional roles. For instance, I frequently consulted ChatGPT for historical background information, akin to conferring with a knowledgeable colleague. These distinct roles—such as a visual design assistant or teacher assistant—formed sub-themes, organized around the specific tasks I assigned to ChatGPT. Beyond identifying these themes, I examined the affordances and constraints associated with each role.

To theoretically ground this data-driven analysis, I then mapped the identified affordances and constraints onto the TPACK framework, exploring how different TPACK elements became prominent in shaping the negotiation of GenAI's potential and limitations. Hence, rather than guiding the thematic analysis, TPACK functioned as a reflective lens to contextualize the findings.

## 4. Findings

The identified patterns of GenAI interactions are visualized in Figure 2 as three distinct collegial roles with associated affordances and constraints.

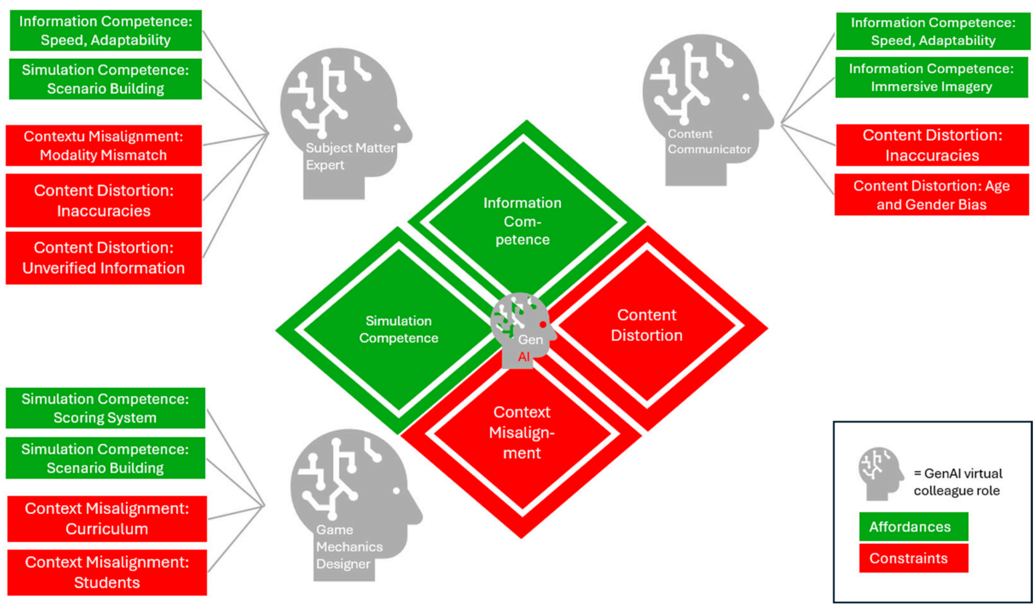


**Figure 2.** GenAI's role as a virtual colleague.

Four core areas of GenAI functionality were identified, namely *information competence*, *simulation competence*, *content distortion*, and *context misalignment*. These were interpreted either as beneficial (green in Figure 2) or challenging (red) to the design process. Furthermore, the analysis identified three distinct roles assigned to GenAI, which were *subject matter expert*, *content communicator*, and *game mechanics designer*. Certain identified benefits and challenges were specific to particular roles, as indicated in Figure 2.

To address Research Question 1 (what characterized the use of generative AI in the design process), the next sections explore GenAI's collegial roles, along with their specific affordances and constraints. To address Research Question 2, each section concludes with a consideration of the role of TPACK in my negotiation of these affordances and constraints.

### *4.1. GenAI as Subject Matter Expert*

For historical background research, I consulted ChatGPT as a virtual *subject matter expert*. Its key advantage was its *information competence*, specifically its extraordinary *speed* and *adaptivity*—the capacity to provide information tailored to specific needs. This allowed me to efficiently access auxiliary information that was potentially useful but would have been time-consuming to research using encyclopedias. As a basic example, when asked "Since when has July 14th been commemorated in France?" (query dated 14 December 2023), ChatGPT provided a prompt answer that supplemented the information in my encyclopedia reading.

ChatGPT's subject matter adaptivity also influenced the simulation's design. For instance, I consulted it about "the affair of the diamond necklace", a court scandal preceding the French Revolution. Although the affair's role is somewhat indirect, I believed its intricacies could heighten students' engagement with the simulation. When queried, ChatGPT effectively incorporated the retrieved information into a scenario, even suggesting points-based awards for resolving the incident. This highlights how ChatGPT's *simulation competence* can be integrated into its role as subject matter expert, an affordance not provided by traditional (print and online) sources of information. Although the diamond necklace scenario was ultimately omitted due to time constraints, students' interest was piqued when Mary introduced the affair before the simulation. This further indicates ChatGPT's potential to deliver timely, tailored, and simulation-relevant information that would have otherwise been impractical to research.

Despite these advantages, the subject matter expert role posed constraints. One key limitation was *context misalignment*, particularly *modality mismatch*—its text-based interface lacked the visually enriched and structured information found in books and online encyclopedias. Additionally, managing and storing information was—in the context of background research—cumbersome within the chat format, and the information had to be organized in other formats, such as One Note files. Another issue was *content distortion* in the form of *historical inaccuracies*, albeit minor ones. For instance, ChatGPT incorrectly stated that financial chief de Calonnes's first Assembly of Notables was held in 1788, when the correct year is 1787. While such errors were not significant (a second assembly was indeed held in 1788), ChatGPT's reluctance to provide references reduced its reliability. This tendency towards *unverified sources* led to a reliance on reputable reference sites such as "World History Encyclopedia" (*World History Encyclopedia*, 2024) and the Swedish online encyclopedia "Nationalencyklopedin" (*Nationalencyklopedin*, 2024), somewhat diminishing ChatGPT's role as a subject matter expert.

### *4.2. TPACK and the Subject Matter Expert Role*

From a TPACK perspective, content knowledge (CK) was essential when engaging with ChatGPT as a subject matter expert. CK informed both prompt design and the evaluation of ChatGPT's historical accuracy. Additionally, technological knowledge (TK) was helpful in maintaining awareness of ChatGPT's tendency to generate incorrect information (hallucinations) and for identifying alternative software to efficiently access and manage information.

In this initial phase of background research, technology-related instructional considerations—in other words, technological and pedagogical content knowledge (TPK and PCK)—were less prominent. Instead, general pedagogical knowledge (PK) sometimes influenced the process, as the diamond necklace scenario illustrates. Its inclusion was based on the general principle that intriguing historical details might engage students (PK). However, had my contextual knowledge (XK) of Mary's students been stronger, it likely would have more precisely influenced both the background research process and my interactions with ChatGPT as a subject matter expert. Furthermore, at the level of curricular context, XK played a vital role in ensuring that the selection of subject matter aligned with relevant educational goals.

### *4.3. GenAI as Game Mechanics Designer*

My background research provided a necessary foundation for creating the simulation's mechanics, including roles and objectives, scoring, and scenarios. In this development phase, I utilized "History Gamemaster", a game-design-tailored ChatGPT bot that functions as a *game mechanics designer* colleague. Its primary strength was *simulation competence*, an apparent familiarity with historical simulations manifested in actionable design suggestions. For instance, in response to a relatively unspecified query for a simulation design suggestion, History Gamemaster provided an extended outline of a simulation it described as "a team-based role-playing game where students immerse themselves in key historical periods, assuming the roles of significant figures and groups" (response dated 9 January 2024). Even without specified prompts, History Gamemaster's outline featured familiar gameplay mechanics such as turns, actions, resources, and events.

Building on History Gamemaster's blueprint and gradually refining my queries, I then requested a turn-based points-driven role-playing game which yielded an outline suggestion for a simulation ("Revolution: Liberté, Égalité, Fraternité") set in 1789, focused on individual roles with a game master (the instructor) awarding points for personal goal achievement. While this further illustrates the simulation competence of the GenAI tool, it also highlights a notable limitation, namely *context misalignment*, specifically misalignment with the *curricular context*. While History Gamemaster's suggestion offered a tangible learning experience, it did not fully align with my understanding of the Swedish history syllabus' emphasis on structural explanations. My concern was that a focus on individual actions would detract from an understanding of fundamental factors, and to address this, I queried History Gamemaster to adapt the design towards faction-based competition as follows:

> *I'd like a suggestion for scenario for the above game, where students are assigned different factions. What would their respective objectives look like and what would be reasonable points system for tracking the factions' progression in the game? (prompt dated 9 January 2024)*

History Gamemaster responded with a scenario titled "The Estates-General Crisis" set in 1789, with students representing factions (clergy, nobility, commoners, royalists, and revolutionaries). While this was a slight improvement in terms of factorial explanations, I deemed it necessary to further highlight political structures and underlying long-term causes, leading to the following revised prompt:

> *"If I would like the game to include a phase with events leading up to the revolution of 1789, what would be some key events to react to for these groups?" (9 January 2024).*

To this, History Gamemaster responded by suggesting five events, with the earliest (the Assembly of Notables) playing out in 1787 (thus rectifying the slightly incorrect information earlier provided by ChatGPT). Not convinced that the suggested timeframe of only two years would sufficiently address long-term causes, I drew on my background research to construct an expanded event timeline—starting with the Seven Years War in 1756—and an assignment of factions that addressed the political, socioeconomic, and demographical heterogeneity of 18th-century France. For instance, "Clergy" was differentiated into rich, conservative, and urban clergy, as opposed to poor, reformists, and rural.

From this, I constructed a more detailed prompt, indicating events and factions. History Gamemaster's response was satisfactory in that it was—in my assessment—congruent with the relevant curricular context, now incorporating differentiated factions into the game mechanics.

Third Estate: Rich, Conservative, Urban

- Objective: Gain political influence equal to their economic power without upsetting the social order. Points for forming beneficial trade guilds and gaining seats in local governments.
- Characters: Merchant Jacques, Financier Louis, Trader Madeleine (response dated 37 March 2024)

Another contextual misalignment was the GenAI tool's lack of insight into classroom dynamics. For instance, the scoring system proposed by History Gamemaster was, in Mary's estimation, insufficient given her students' need to develop their social skills. Ultimately, this led us to incorporate "cooperation points" into the game mechanics. A further limitation of the tool was its tendency towards anachronistic *content distortion*. For instance, History Gamemaster suggested including the Sans-Culottes—a term coined only after the 1789 events—as a pre-revolutionary faction. However, since we deemed it more manageable for students to obtain information on the historical context using that name, the anachronistic label was kept intact.

### *4.4. TPACK and the Game Mechanics Designer Role*

As a game mechanics designer colleague, GenAI contributions were invaluable for accelerating the design process. However, my case of GenAI interactions indicates the need for an integrated and dynamic use of TPACK elements to navigate its limitations and maximize its potential. While technological knowledge (TK) concerning ChatGPT's functionality enabled me to leverage the simulation competence of the bespoke version of History Gamemaster, its output required careful consideration and adaptation. One aspect was factual; content knowledge (CK) was necessary to recognize potential historical inaccuracies (e.g., the Sans-Culottes). However, a more prominent aspect was instructional, involving the integration of curricular context knowledge (XK) and pedagogical content knowledge (PCK) to identify misalignments between History Gamemaster's design suggestion, educational goals, and instructional needs.

This is evident in the examination of GenAI interactions concerning scoring and scenario building, where GenAI's initial focus on individuals' experiences with the Revolution would be insufficient for curricular-mandated goal achievement, a position I adopted based on curricular context knowledge. The further decision to organize the simulation around socially and economically diverse factions can be seen as a PCK-informed assessment that this type of mechanism would foster students' deeper understanding of the political context. Moreover, XK also played a role in the design process, illustrated by the decision to incorporate cooperation points to promote the type of social interaction needed for simulation-based pedagogies in this particular group of students.

### *4.5. GenAI as Content Communicator*

To create a more tangible learning experience, I decided to integrate visual representations of key elements such as characters, settings, and concepts within the simulation. At this stage of the process, ChatGPT fulfilled the role of *content communicator*, facilitating the presentation of the simulation. I employed a specialized version of ChatGPT, "KnowHistoryPeople", which generates images of historical figures. The tool's key advantage laid in its *information competence*, specifically its ability to generate *visual imagery* to build a historical atmosphere, as illustrated in Figure 3, generated in response to the prompt "I'd like a black-and-white image in an 18th-century style, depicting a high-ranked member of the French clergy, such as a cardinal or a bishop" (10 April 2024).

**Figure 3.** Image of cardinal, generated by KnowHistoryPeople.

Classroom field notes indicate that these images effectively captured students' interest. For example, students often acted in role, presenting themselves with their characters' name in sessions where the teacher asked for each group's decision on how to act on the political development of various events.

Other instances of the tool's affordances included its *speed* and *adaptivity*. As an example of adaptivity, KnowHistoryPeople initially deemed the task of generating the images needed for the simulation "immense" (response dated 10 April 2024) and beyond its capacity but instead suggested generating detailed textual descriptions which could be used as prompts for image creation. While the resulting image creation process was somewhat protracted—the tool's output was restricted to 5–6 images per hour—the speed must still be deemed exceptional.

Despite these benefits, certain challenges became evident. A key issue was *content distortion* in the form of *age and gender bias*. For instance, a 62-year-old character, "Baroness Eloise" was depicted as a youthful woman. Despite repeated queries for revised depictions, ageism and gender stereotyping remained in the images (Figures 4 and 5). To resolve these issues, I resorted to manual cropping of the images using PowerPoint before Mary and I introduced them to her students.

**Figure 4.** Revised images of ""Baroness Eloise" generated by KnowHistoryPeople.

**Figure 5.** Image of "Baroness Eloise", further revised.

Another salient limitation was content distortion in the form of *anachronisms*. For example, an attempt to depict the 18th-century process of enclosure movement (land privatization) resulted in the introduction of anachronistic elements, such as a tractor (Figure 6).

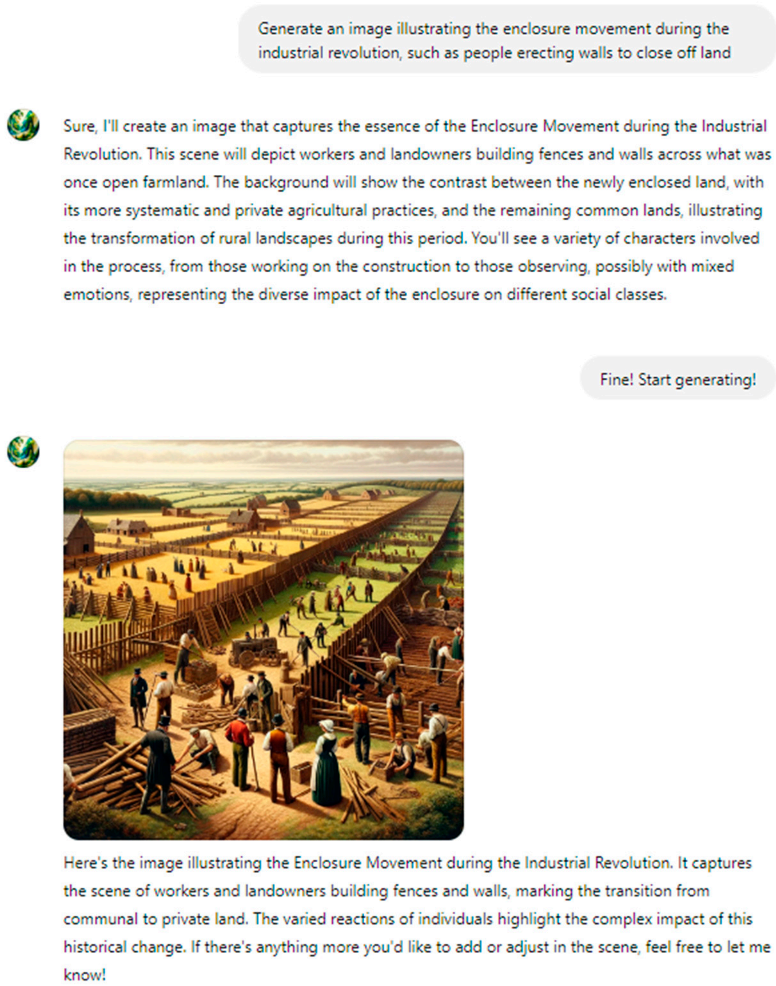


**Figure 6.** Chatlog from the creation of an image illustrating the enclosure movement.

Although I provided ChatGPT with a historically accurate reference image to rectify the image, the output remained unsuitable for educational use. Ultimately, I relied on trusted sources like textbooks and historical websites for accurate illustrations.

### *4.6. TPACK and the Content Communicator Role*

The affordances and constraints of GenAI as a content communicator further highlight the complex and dynamic interplay of TPACK elements. A key motivation for using images—their ability to immerse students in instructional content—reflects educators' pedagogical knowledge (PK). However, obtaining images that are both accurate and tailored to specific instructional needs can be challenging. My interactions with GenAI interactions demonstrate that the emerging technological knowledge (TK) of ChatGPT's capabilities enhances PK and PCK by facilitating the creation of pedagogically useful images.

Content knowledge (CK) was integral to designing effective prompts and evaluating the accuracy of generated images. Additionally, contextual knowledge (XK) influenced the decision to reject certain images that did not align with the larger curricular context, particularly the values schools want to convey regarding age and gender issues. Again, TK enhanced the use of images, thereby enabling the digital editing needed to remove age and gender bias.

Pedagogical content knowledge (PCK) informed my decision to use ChatGPT to illustrate concepts—specifically, the enclosure movement—in ways that might enhance textbook representations. However, following several unsuccessful attempts, applying technological pedagogical knowledge (TPK) was needed to recognize the tool's limitations. At the same time, TPK is an evolving element. Through interactions with KnowHistoryPeople, my prompts and strategies for image creation were refined.

## 5. Discussion

This self-study investigation examined the role of GenAI tools in historical simulation design, using the TPACK framework as a lens for reflection. The findings demonstrate that by envisioning GenAI tools as *virtual colleagues* (Meron & Araci, 2023), educators can leverage these tools' versatility, speed, game design competence, and information processing to enhance the design of simulation-based learning experiences. These findings resonate with research by Meron and Araci (2023), Salinas-Navarro et al. (2024), and others. The employed GenAI tools worked adaptively to facilitate background research, accelerate the design process, provide valuable and simulation-relevant design suggestions, and enhance the visual presentation of the game. In other words, educators should decidedly explore this novel tool, and—by way of experience—increase their efficiency in using it.

However, a key takeaway from the study is that GenAI tools have notable limitations, and that historical content knowledge (CK) and contextual knowledge (XK) are crucial to maximize their potential and mitigate limitations. While previous research has emphasized pedagogical content knowledge (PCK) as central to instructional effectiveness (Tuithof et al., 2019), the introduction of generative AI seems to necessitate a more pronounced emphasis on historical CK and especially XK if teachers are to critically assess AI-generated contributions to their design. In the next sections, I discuss these implications using the TPACK framework (Mishra & Koehler, 2006).

### 5.1. Role of Content Knowledge (CK) and Pedagogical Content Knowledge (PCK)

The findings emphasize the importance of CK both in crafting effective prompts and in critically evaluating AI-generated responses. The recommendation for teachers who want to maximize GenAI's simulation design potential is therefore to focus on topics they know well and use GenAI tools judiciously to retrieve additional information. While ChatGPT's speed and precision can enhance teachers' CK, its tendency to present incorrect information with undue confidence (Bender, 2024) underscores the need for teacher-led critical assessment. This issue is further compounded by GenAI' lack of transparent citations, making it an "epistemological nightmare" (Peters et al., 2024, p. 829), although there are encouraging signs that the problem may be decreasing as AI models evolve (Walters & Wilder, 2023). However, as long established, assessing the credibility of knowledge claims requires integrating domain-specific expertise (i.e., CK) with source evaluation skills (Barzilai & Zohar, 2012; Wineburg, 1991).

While overt anachronisms (e.g., as reported in the findings, a tractor in an 18th-century environment) are easy to detect, subtler inaccuracies—such as slightly incorrect dates—may be more difficult to negotiate, especially when citations are absent. However, within simulation-based pedagogies, not all inaccuracies are equally detrimental to historical learning (Arnold, 1998; Karlsson, 2014). For instance, the anachronistic inclusion of Sans-Culottes exemplified in the findings was not perceived as interfering with students' understanding of long-term causes. Rather, it can be interpreted as a form of *narrative truth* (Wertsch, 1998)—an inaccuracy that enhances simulation coherence without distorting historical meaning (McCall, 2012).

Importantly, PCK and CK are crucial rules in assessing the pedagogical implications of AI-assisted instructional designs (Khalloufi-Mouha, 2024). Since professional collaborative environments are conducive to PCK (Dogan et al., 2016), it is recommended that educators collaborate—both with human and virtual colleagues—to determine the level of historical precision needed for a given simulation, its primary learning objectives, and what related tasks can be deferred to tools like ChatGPT.

### *5.2. Technological Knowledge (TK), Technological Pedagogical Knowledge (TPK), and Prompt Literacy*

The findings highlight the need for educators to critically assess not only AI-generated content (using their CK) but also how they query these tools for information, which requires technological pedagogical knowledge (TPK). Since TPK evolves with experiences, another recommendation for GenAI usage is to invest time in structured training sessions, ideally in collaborative professional settings, to share, reflect upon, and explore experiences with these tools. This can strengthen both teachers' TK about fundamental GenAI functionality, such as how to customize ChatGPT bots for simulation design, and TPK of its instructional potential. Since many educators remain hesitant to adopt AI (Yang et al., 2025), structured training and collegial collaboration could help bridge the gap between AI capacities' "super-exponential" growth (Baklaga, 2024, p. 112) and its practical classroom applications.

Some challenges observed in this study—such as anachronisms and gender biases in AI-generated images—could also be better addressed in organized forums for sharing TK and TPK, rather than relying on informal spontaneous collaboration, as was often the case in the teacher-to-teacher interactions reflected in the data. Additionally, it is evident from the data that ChatGPT queries are not always effective in yielding the desired result. This reinforces the need for research into educators' prompt literacy (Maloy & Gattupalli, 2024; Chen et al., 2024).

### *5.3. Contextual Knowledge (XK) and Curricular Context*

A key insight of the study is that contextual knowledge (XK) is essential for successful GenAI-assisted simulations. A lack of contextual knowledge hampered GenAI, especially in instances calling for a deep understanding of classroom and curricular contexts. Prior to GenAI engagement, educators should carefully align their simulation with macro-level curricular goals and students' need for micro-level scaffolding (Walqui, 2006). To make these alignments, teachers must rely on their PCK (Shulman, 1986), and specifically—within the TPACK framework—their contextual knowledge (XK) about curricular requirements and classroom dynamics (Mishra, 2019; Park & Oliver, 2008). While future advancements may enable GenAI tools to align more effectively with curricular goals (Baklaga, 2024; Ning et al., 2024), their current limitations mean that translation from the curriculum to teaching via simulation-based pedagogies remains dependent on educators (Tanweer & Ismail, 2024).

To exemplify from the data, the prioritization of certain curricular goals—such as helping students understand how individuals' decisions in the past were shaped by broader political contexts—led to the design choice of structuring the simulation over an extended period rather than a single historical event. Similarly, the decision to incorporate collaboration points into the simulation's design stemmed from the XK-informed judgment that this would benefit students' cooperation skills. These types of context-dependent instructional decisions are less likely to be made by ChatGPT. The recommendation is therefore to maintain awareness that examples of AI-assisted simulations (e.g., Dai et al., 2024) are likely to remain dependent on teachers' mediation of these simulations' design (Ji et al., 2023).

Research suggests that well-developed PCK significantly enhances such instructional design mediations (Nilsson & Vikström, 2015; Park & Oliver, 2008; Wongsopawiro et al., 2017). Therefore, educators should deliberately define their learning objectives before engaging in-depth with GenAI tools. Ideally, design decisions are collaboratively developed within professional learning communities (PLCs), which have been shown to positively impact PCK quality (Dogan et al., 2016). While available GenAI tools are not yet capable of independently designing historical simulations, querying them for ideas can support productive discussions within PLCs (Carrasco Rodríguez, 2023; Mocanu, 2024).

### *5.4. Limitations of the Study*

Some limitations of this study warrant consideration. The study is limited to a singular self-studied case of GenAI-assisted simulation design. Since the study's scope is restricted to a simulations' design phase, its empirical examples should be expanded through studies examining such tools' broader impact on history learning—particularly regarding relationships between simulation design, technological proficiency, content expertise, and student learning. Moreover, while the self-study methodology enables deep contextual understanding, it is prone to subjectivism. For instance, as an enthusiastic adopter of GenAI, my analysis runs the risk of overestimating its benefits or overlooking challenges. Similarly, my dual role as a teacher and researcher introduces additional interpretive risks, as educational expectations may influence the analysis. While I have taken steps to reduce bias, as outlined in the Methods section, these findings should be triangulated with findings from similar self-study research (e.g., Cooper, 2023; Meron & Araci, 2023).

### *5.5. Future Research Directions*

While this study offers empirical insights into GenAI's role in history education, several areas require further exploration. Future research should examine structured intervention models that help teachers integrate AI effectively into simulation-based pedagogies. Given the importance of CK in evaluating AI-generated content, a promising avenue is investigating instructional strategies that enhance teachers' ability to critically assess AI outputs (Mao et al., 2024). Further studies should also assess GenAI's impact on student engagement within simulations (Mohamed et al., 2024), particularly how AI-mediated interactions influence motivation, conceptual understanding, and historical reasoning. Another key area is the role of contextual knowledge (XK) in such AI integrations. Although studies highlight the potential of AI-assisted role-playing and simulations (Aravantinos et al., 2024), their full integration into instructional design remains underexplored.

### *5.6. Conclusions*

This study highlights both the potential and limitations of GenAI tools (specifically, ChatGPT version 4) in history education. Despite limitations—such as its assertive delivery of unverifiable claims and its lack of contextual knowledge—GenAI offers valuable support in simulation design. However, its effectiveness depends on educators' negotiation of content knowledge, instructional design, technological know-how, and, importantly, in-depth knowledge about educational contexts. AI tools are not yet capable of fully designing historical simulations independently, but they can enhance design by generating input that guide and inspire simulation design decisions. Ultimately, GenAI should be seen as an assistive tool rather than a substitute for teacher expertise. To maximize its benefits, educators must critically engage with AI-generated content, refine their prompt literacy, and integrate AI thoughtfully within their pedagogical framework, preferably within professional learning communities. Future research should continue to explore how AI can be leveraged to enrich simulation-based history education while addressing its inherent epistemic challenges.

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