education sciences

MDPI

Opinion

Making Historical Consciousness Come Alive: Abstract Concepts, Artificial Intelligence, and Implicit Game-Based Learning

Julie Madelen Madshaven [1,*], Christian Walter Peter Omlin [1] and Apostolos Spanos [2]

[1] Department of Information and Communication Technology, Faculty of Engineering and Science, University of Agder, 4879 Grimstad, Norway; christian.omlin@uia.no
[2] Department of Religion, Philosophy and History, Faculty of Humanities and Education, University of Agder, 4630 Kristiansand, Norway; apostolos.spanos@uia.no
* Correspondence: julie.madshaven@uia.no

Abstract

As new technologies shape education, helping students develop historical consciousness remains a challenge. Building on Nordic curricula that emphasize students as both "history-made" and "history-making" citizens, this paper proposes an approach that integrates artificial intelligence (AI) with implicit digital game-based learning (DGBL) to learn and develop historical consciousness in education. We outline how traditional, lecture-driven history teaching often fails to convey the abstract principles of historicity (the idea that individual identity, social institutions, values, and ways of thinking are historically conditioned) and the interpretation of the past, understanding of the present, and perspective on the future. Building on Jeismann's definition of historical consciousness, we identify a gap between the theory-rich notions of historical consciousness and classroom practice, where many educators either do not recognize it or interpret it intuitively from the curriculum's limited wording, leaving the concept generally absent from the classroom. We then examine three theory-based methods of enriching teaching and learning. Game-based learning provides an interactive environment in which students assume roles, make decisions, and observe consequences, experiencing historical consciousness instead of only reading about it. AI contributes personalized, adaptive content: branching narratives evolve based on individual choices, non-player characters respond dynamically, and analytics guide scaffolding. Implicit learning theory suggests that embedding core principles directly into gameplay allows students to internalize complex ideas without interrupting immersion; they learn by doing, not by explicit instruction. Finally, we propose a model in which these elements combine: (1) game mechanics and narrative embed principles of historical consciousness; (2) AI dynamically adjusts challenges, generates novel scenarios, and delivers feedback; (3) key concepts are embedded into the game narrative so that students absorb them implicitly; and (4) follow-up reflection activities transform tacit understanding into explicit knowledge. We conclude by outlining a research agenda that includes prototyping interactive environments, conducting longitudinal studies to assess students' learning outcomes, and exploring transferability to other abstract concepts. By situating students within scenarios that explore historicity and temporal interplay, this approach seeks to transform history education into an immersive, reflective practice where students see themselves as history-made and history-making and view the world through a historical lens.

Keywords: game-based learning; artificial intelligence; historical consciousness; implicit learning

check for updates

Academic Editor: Panagiotes S. Anastasiades, Charalampos Mouzakis, Konstantinos Kotsidis and Meihua Qian

Received: 15 July 2025
Revised: 12 August 2025
Accepted: 26 August 2025
Published: 30 August 2025

Citation: Madshaven, J. M., Omlin, C. W. P., & Spanos, A. (2025). Making Historical Consciousness Come Alive: Abstract Concepts, Artificial Intelligence, and Implicit Game-Based Learning. *Education Sciences*, *15*(9), 1128. https://doi.org/10.3390/educsci15091128

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

Teaching historical consciousness is challenging because it's intangible, difficult to measure, and develops gradually over time. Traditional, lecture-driven history teaching often fails to convey its abstract principles. Emerging tools such as artificial intelligence (AI) and digital game-based learning (DGBL) offer a promising solution, providing immersive, adaptive experiences that bring historical consciousness to life (Madshaven et al., 2025). This paper explores how combining AI with implicit (learning without explicit instruction) DGBL might help students build this important skill. The discussion is grounded in the Nordic tradition, which sees students as both shaped by history and as contributors to it (what in history didactics is traditionally coined as history-made and history-making) (Rüsen, 2004; Spanos, 2024).

Drawing from research on implicit learning, AI, and DGBL, this work brings together different perspectives on how students learn. While the discussion outlines feasible implementation approaches, providing full technical specifications is beyond its scope. The primary focus is on pedagogical design and theoretical integration. The discussion begins with the theoretical foundations of historical consciousness and the current challenges of teaching it, and then examines how DGBL, AI, and implicit learning can enhance instruction and engagement. Building on these insights, a model of AI-enhanced implicit DGBL is presented, followed by a research agenda to assess its effectiveness.

2. Context and Rationale

In Sweden, Denmark, and Norway, educational curricula emphasize teaching historical consciousness as a core element of history education, while also highlighting the importance of related and distinct concepts such as historical temporality, historical thinking, and historical empathy. While these concepts support historical consciousness, they are not its core components. At its foundation, historical consciousness rests on two pillars: historicity (the insight that we are both history-made and history-making) and temporal interplay (the interplay between interpretations of the past, perception of the present, and anticipation of the future). In Norway, the curriculum expresses the importance of developing historical empathy, source criticism, and the ability to see diverse perspectives. Students should come to see themselves as "history-made and history-making" individuals (Kunnskapsdepartementet, 2019), strengthening their historical awareness through critical source analysis and empathetic engagement with the past. Similarly, Sweden focuses on the goal that "teaching in history shall aim to ensure that pupils develop their historical consciousness" (Skolverket, 2024) through knowledge of historical concepts, understanding how history is created through interpretations of sources, and recognizing the various ways history is used. Denmark centers on the temporal interplay by noting that everyone is shaped by history and is an active participant who contributes to shaping both personal and societal development over time (Børne- og Undervisningsministeriet, 2024).

These curricula guidelines point to the need for pedagogical methods that help students move beyond theory and study of facts. Using traditional lecture-driven methods to teach historical consciousness can be challenging, especially when an important aim is to help students feel the relevance of history to their own lives (Rüsen, 2004; Spanos, 2024). We postulate that history teaching of such abstract concepts can greatly benefit from an AI-driven, implicit DGBL approach. DGBL offers an interactive platform where students can experiment and revisit decisions to see the complexities of historical events (Plass et al., 2015, 2020a; Whitton, 2010). AI can adapt challenges and narratives based on individual decisions for students to realize how small shifts in the context of viewpoint can produce different outcomes (Atkinson et al., 2019). An implicit learning approach embeds these lessons directly into gameplay, mirroring the tacit, experiential way students come

to "think historically" (Oceja et al., 2022). Students learn through actions and narratives rather than through explicit lectures, and the method aligns the immersive mechanics of the game with the nuanced processes by which historical consciousness develops. Through game-based scenarios, students can assume the roles of historical actors, explore multiple perspectives, and shape outcomes to have an immersive experience, actively improving historical consciousness.

3. Current Challenges in Teaching Historical Consciousness

Rapid social, technological, and political change makes historical consciousness more important than ever. With growing volumes of digital information and competing narratives, students need to recognize that history is interpreted and used for various purposes, and they need the skills to understand that historical content must be seen from multiple viewpoints.

Historical consciousness has been a concept in historical studies since the 1960s, but it did not become a distinct topic of research until the late 1970s, when Karl-Ernst Jeismann published his essay on the four dimensions of historical consciousness (Thorp, 2013):

1. Historical consciousness is the ever-present awareness that all human beings and all forms of social integration they have created exist in time, meaning that they have a history and a future and are dynamic.
2. Historical consciousness incorporates the connection between interpretation of the past, understanding of the present, and perspective on the future.
3. Historical consciousness is how the past is present in representations and conceptions.
4. Historical consciousness rests on a common understanding based on emotional experiences. This common understanding is an essential part of the construction and enforcement of human societies.

Researchers still disagree on its exact scope (the breadth and boundaries of what is included in the term historical consciousness) and how such consciousness develops in individuals (Dietz, 2019; Landro, 2020; Thorp, 2013), but Jeismann's dimensions, especially the first two, serve as a common point of departure. From the 1970s onwards, different traditions in history education emerged. The German-Nordic tradition emphasized historical consciousness with an ontological approach through temporal dimensions and identity formation, while the Anglo-American tradition emphasized historical thinking, with an epistemological focus on source work and disciplinary methods (Seixas, 2017). The curricula in Denmark, Norway, and Sweden retain the ontological and identity-forming aspects of historical consciousness, while also incorporating the epistemological and methodological aspects of historical thinking through source work, inquiry, and critical reflection (Kunnskapsdepartementet, 2019; Skolverket, 2024; Børne- og Undervisningsministeriet, 2024). While mixing the two traditions in the curricula can offer students a broader toolkit, it also risks diluting key concepts into a superficial checklist, leaving both traditions underexplored.

Empirical studies reveal why that risk matters. Torgeir Landro's (2020) review of nine Norwegian and Swedish studies reveals a large gap between the theory-rich notion of historical consciousness and the way it is understood in schools. Many educators either do not have a clear perception of the concept or interpret it intuitively from the curriculum's limited wording, which leaves the concept generally absent from the classroom. A clear definition of historical consciousness is essential because Nordic curricula view it as central to democratic citizenship and personal identify formation. Students need to move beyond memorizing facts to see how the past, present, and future fit together, understand how institutions and values change over time, and how their own choices can influence what comes next (Dietz, 2019; Landro, 2020; Thorp, 2013).

While it is agreed in curricula and research communities that history teaching should strengthen students' historical consciousness, there is debate about how this consciousness emerges and how it develops within an individual (Dietz, 2019; Thorp, 2013). Therefore, the central challenge is how educators can move students beyond memorizing historical facts towards developing historical consciousness. Two overarching principles of historical consciousness seem to join both schools, curricula and the core intuition of historical consciousness: historicity and temporal interplay. Historicity is the understanding that everything human (individual identity, social institutions, moral values, ways of thinking) is historically conditioned and therefore subject to change. The temporal interplay means holding all three temporal horizons in mind, seeing how the perception of each one of them influences the perception of the other two.

Despite these shared pillars, teachers still struggle to translate the ideas into classroom practice. To bridge this divide, we need pedagogical approaches that translate historical consciousness into concrete learning experiences.

4. Enriching the Teaching and Learning of Historical Consciousness

4.1. Digital Game-Based Learning

DGBL leverages games as a teaching tool to enhance engagement and provide learning experiences (Plass et al., 2015, 2020b). This approach offers a fun environment where students can explore goals, problem-solving, competition, and narrative-driven interaction, developing skills that often translate into real-life situations (Jääskä et al., 2022; Mayer, 2020). When applied to historical consciousness, games can simulate historical settings from multiple perspectives, allowing students to actively participate in scenarios where their decisions lead to consequences through time (Wright-Maley et al., 2018).

Historical consciousness is an abstract, multi-dimensional skill. Unlike subjects tied to concrete experiments or step-by-step methods, historical consciousness asks students to navigate metacognitive reflection and intertwined temporal perspectives with nothing tangible to hold onto.

DGBL has found widespread success in the field of science, technology, engineering, and mathematics (STEM), where learning objectives tend to be more concrete and task-oriented (e.g., solving math problems, programming, or understanding scientific processes) (Byusa et al., 2022; Klopfer & Thompson, 2020; Rastegarpour & Marashi, 2012), but its potential for teaching abstract concepts, like historical consciousness, could be equally significant. Zhurakovskaia et al. (2021) used both a 2-D browser game and a VR simulation to teach buoyancy/density, reducing misconceptions and helping students revise mental models through direct experience. DGBL has also shown promise in teaching other abstract concepts, such as critical thinking. de Vero and Barr (2023) developed a text-based game to teach students critical thinking skills in the context of history. In the game, students take the role of a record keeper in a fantasy world, where they assess source validity and bias under time pressure to mirror real-world critical thinking challenges.

These examples show that embedding abstract principles into gameplay makes the invisible visible. Applied to historical consciousness, DGBL has the potential of shifting the focus from "right answers" to engaging with historicity and temporality. For example, the players inhabit roles shaped by earlier events (history-made) yet still exercise agency to change unfolding storylines (history-making). Through branching narratives and time-jumps, they can witness how small decisions influence the future, reinforcing the temporal interplay.

4.2. Artificial Intelligence

Most DGBL experiences follow a fixed, scripted narrative. Every player reads the same texts, meets the same non-player characters (NPCs), and faces the same puzzles. AI could expand this into a responsive learning system that adjusts and reacts to every student's decision (Yannakakis & Togelius, 2018). This can be particularly relevant for teaching historical consciousness because AI can reproduce the complex, unpredictable, and multiple perspectives in history.

AI's capacity for adaptive gameplay means that as a student makes progress, the system can adjust the difficulty and nature of challenges in real time (Moon et al., 2025; Song et al., 2024). This can be implemented, for example, through natural language processing (NLP) models trained on curated datasets (Gallotta et al., 2024). Dialogue generation for NPCs can draw from pre-authored templates augmented with AI-driven variation to ensure authenticity and diversity in responses. Dynamic content generation can introduce new stories and tasks that build on each student's earlier choices so that students do not share the exact same experience. The branching narrative logic can be managed through a hybrid structure with a pre-defined decision tree to preserve core historical events and causal relationships, combined with procedural content generation to introduce contextual variation based on each player's choices (Gallotta et al., 2024). Personalized feedback can be embedded into NPC interactions, with dialogue and behavior adjusting to a student's in-game actions, making reflection immediate and contextually relevant. In the background, automated analytics can log each student, identify recurring misunderstandings, and provide timely scaffolding or alert teachers of students falling behind (Banihashem et al., 2023).

Commercial titles and controlled studies illustrate these benefits. In commercial contexts, Civilization VI's AI-controlled opponents continually adapt to players' decisions to create an unpredictable and immersive environment where players experience historical events and decisions firsthand. In the classroom, Chen and Chang (2024) split 202 seventh-grade students playing a physics game into three conditions: game-only; game and ChatGPT (GPT-3.5-Turbo); and game, ChatGPT, and worked-out example prompts. The group using ChatGPT with examples outperformed the game-only group on post-test learning outcomes and reported higher intrinsic motivation and experienced lower cognitive load (the mental effort required by the complexity of the material). Gameplay analytics revealed that students with example-scaffolded AI support engaged in more strategic, reflective interactions, demonstrating how a conversational agent can enhance both affective and cognitive dimensions of DGBL.

Embedding an AI agent in a game about historical consciousness can help students discover how past decisions shape present and future outcomes through their own choices rather than through lectures. By generating scenarios based on player actions, AI-enhanced DGBL places students in a sandbox where they can experience temporal interplay. For historicity, the AI could remind players of their inherited contexts and then adapt future scenarios based on their choices, letting students experience both the history-made foundations they inherit and their own history-making agency in shaping what comes next.

These capabilities make AI-enhanced DGBL a powerful tool for bringing both temporal interplay and historicity to life. However, there are some important challenges that must be addressed to keep AI-enhanced DGBL reliable and responsible.

AI is not immune to mistakes and can sometimes generate or reinforce false information, especially if the data it draws on is incomplete or biased (Vicente & Matute, 2023). To prevent this, the game should be hosted on a secure server and restricted to a closed, curated dataset, such as the course textbook and vetted sources, so that there's no external data fetched during gameplay (Wagan et al., 2023). AI systems can also struggle to

technically manage complex branching narratives and dynamic gameplay, resulting in glitches or inconsistent experiences. Designing broader narrative arcs with procedural variation within them, combined with playtesting, helps contain the complexity without sacrificing variety.

Because AI-driven scenarios can oversimplify complex historical issues, each session should end with guided debrief activities in the classroom. Finally, transparency and data privacy must be guaranteed. Students should be provided with informed consent, explaining what will be collected, how it's used, and for how long it will be stored, storing only the minimal anonymized data for adaptive gameplay.

4.3. Implicit Learning

To bring historical consciousness alive, the abstract concepts should be tied directly into student experience without interrupting the narrative for pop-up lectures. Implicit learning offers exactly that: students absorb ideas through repeated, meaningful interaction, often without even realizing they're being taught (Reber, 1989). We see it in language acquisition, where students use correct grammar and vocabulary without ever studying rules explicitly because they absorbed patterns through exposure and meaningful use (Borge Garnaas & van den Tillaar, 2024; Cleeremans et al., 1998; Vinter et al., 2022). Using implicit learning as an approach in DGBL allows for a natural and intuitive learning process where learning is a byproduct of engagement from embedding learning objectives into the game mechanics and the narrative. In DGBL of historical consciousness this means that players learn through witnessing shifts in power, identity, and history through their choices in the game.

Several studies demonstrate the power of embedding core concepts into gameplay. Cao and Liu (2022) compared traditional pop-up tutorials with hints woven into levels. While beginners initially preferred the pop-ups, more experienced players learned just as effectively and enjoyed the experience more when guidance was hidden in the game world. Similarly, in the game *Alert Hockey*, an invisible "karma" system rewarded safe play, and over time players mastered the right strategies simply because good decisions made the game flow more smoothly (Ciavarro et al., 2008). The group with this hidden feedback got better without feeling like they were being taught.

These examples prove that core concepts can live inside mechanics and narrative. Implicit learning is well-suited to developing historical consciousness because it uses firsthand, experiential understanding rather than abstract memorization. It allows students to feel and experience history by living through scenarios and seeing how individual choices shape historical outcomes instead of only being told about them. However, implicit learning alone does not guarantee that students can articulate or transfer what they have learned (ter Vrugte & de Jong, 2017). Explicit activities are still needed to solidify the learning. ter Vrugte and de Jong (2017) show that adding structured self-explanation prompts, collaborative reflection, or partial worked examples can turn tacit knowledge into explicit knowledge. In practice, this could look like a flipped classroom model where students first explore a historical scenario through gameplay, then reconvene to explain their in-game choices, compare strategies, work through case studies, and attend mentored seminars.

5. AI-Enhanced Implicit Digital Game-Based Learning

Bringing these theories together, AI-enhanced implicit DGBL offers a unique way to teach and learn historical consciousness (see Table 1).

Table 1. Components of an AI-enhanced implicit DGBL model for historical consciousness showing how each element is integrated and why it supports learning.

Component	Integration	Rationale	Illustrative Example
Core Mechanics and Narrative	Embed historicity and temporal interplay into game rules with branching storylines that support the improvement of historical consciousness.	Players live out history-made and history-making dynamics, internalizing causal effects and temporal perspective through meaningful interaction.	Fenici and Mosca's (2023) higher education gamebooks used branching narratives that let the students navigate decision points, embedding sustainability learning objectives into interactive storylines.
AI	Integrate AI that adapts difficulty in real time, generate new scenarios based on past decisions, and handle NPC dialogue or prompts that reflect each student's path.	Personalization maintains optimal challenge level, preventing beginners from failing and experts from getting bored. Dynamic content highlights that history is never a fixed, single narrative.	Naseer et al. (2025) piloted an AI-driven adaptive platform that adjusts difficulty in real time. Campitiello et al. (2024) created an AI-driven NPC for a virtual museum that answers students' questions, adapts its explanations to individual needs, and provides personalized guidance.
Implicit Learning	Embed key concepts into the gameplay mechanics so that students pick up historical consciousness principles and mindset through play.	Students absorb complex ideas naturally as they interact with the game. This "learning-by-doing" approach encourages a durable and intuitive understanding without interrupting immersion.	Ciavarro et al. (2008) embedded a hidden "karma" system that subtly rewards safe play in a hockey game. Players internalized desired strategies through gameplay without explicit instruction.
Explicit Reflection	Use explicit points of learning outside of the game. After gameplay, students explain and justify their in-game experiences, discuss with fellow students, and participate in workshops or lectures.	Turning implicit learning into explicit language and knowledge. Metacognitive activities can help students articulate "why" and "how" together with "what happened". Reflection with other peers enhances the individual insight, as well as uncovering alternative viewpoints.	Li et al. (2022) implemented a mini-game-based flipped classroom where brief in-class digital game sessions were followed by teacher-led collaborative discussions and debriefs. The gameplay insights were transformed into explicit learning through guided reflection.

By embedding historicity and temporal interplay into core mechanics, games let students absorb these complex theories through play (Madshaven et al., 2025). AI then transforms this immersive experience into a personalized, responsive learning journey where adaptive challenges keep beginners supported and experts engaged. Dynamic content offers fresh scenarios adapted to each student's choices and intelligent NPCs provide immediate feedback. Pairing this with targeted explicit activities ensures that students can articulate and transfer their knowledge.

To turn these elements into a learning process, we propose a three-phase sequence that ties implicit knowledge back to explicit reflection.

Figure 1 illustrates learning as a continuous cycle of framing, playing, and reflecting. The learning sequence begins with an introduction and framing session in which the teacher reviews the two core pillars, orients students to the game world, and provides any necessary reading or preparatory materials. Students then enter the AI-enhanced implicit DGBL environment, where they explore, collect artifacts, interact with NPCs, and make

consequential decisions. Finally, students reconvene in small groups to share and compare in-game experiences, engage in guided discussions that draw explicit connections to historical concepts, and explore real-world applications of their insights. Those reflections then feed back into the next framing session, deepening understanding in each loop through the cycle. This process of framing, playing, and reflecting ensures that students have structured opportunities to articulate and transfer their learning.

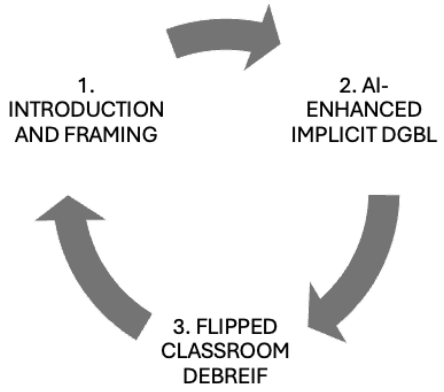

Figure 1. The learning process with AI-enhanced implicit DGBL.

For example, the teacher opens with a 10-min mini-lecture on the 19th-century labor movement, highlighting how individual choices both reflect inherited social conditions (history-made) and shape future outcomes (history-making). Students then enter the game, where they explore a digital street, collect artifacts like protest flyers or newspaper clippings, and interact with AI-driven NPCs (e.g., a factory worker pleading poverty or a political agitator demanding justice), whose dialogue and questions adapt based on each player's prior choices. As students make choices (e.g., join a strike or negotiate with authorities), they will see how those decisions affect their game continuing forward. After playing, students reconvene in small groups where they share their in-game decisions, map the outcomes to real-world causes and effects, and apply their insights to modern scenarios. The next framing session revisits any misconceptions and introduces new materials for the next cycle.

6. Conclusions

This paper contends that AI-enhanced implicit game-based learning holds significant promise for teaching historical consciousness, a competency emphasized in Nordic curricula. The curricula call on students to understand that they are history-made and history-making citizens and to be aware of temporal interplay. It can be difficult to bring that sense of dynamic history into the classroom. By embedding historicity and temporal interplay directly into game narratives and mechanics, AI-enhanced DGBL lets students discover historical consciousness through play. AI keeps the challenge just right, creates new scenarios, and makes the game feel alive so that every student experiences a unique and engaging story. The traditional learning process is still important for learning, so students should still participate in explicit learning activities to make sense of what they have experienced in the game.

Looking ahead, these ideas need to be tested with students to compare how well they perform compared to traditional approaches alone. Longitudinal studies are needed to track how game-based experiences influence students' historical consciousness over time. Furthermore, the practical challenges of creating AI-enhanced DGBL must be addressed to see how well branching narratives, hidden-feedback systems, and AI-driven interactions

perform in a game-based system. Future research could also test this approach with other abstract concepts to explore its broader applicability.

AI-enhanced DGBL could transform the teaching of historical consciousness into an immersive experience where students can explore historical worlds, make meaningful decisions that affect the future, and reflect on the impact of their choices and consequently reflect over their role in influencing history.

Author Contributions: Conceptualization, J.M.M.; methodology, J.M.M.; formal analysis, J.M.M.; writing—original draft preparation, J.M.M.; writing—review and editing, J.M.M., A.S. and C.W.P.O. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: No new data were created or analyzed in this study. Data sharing is not applicable to this article.

Conflicts of Interest: The authors declare that there is no conflict of interest.

Abbreviations

The following abbreviations are used in this manuscript:

DGBL	Digital game-based learning
AI	Artificial intelligence
NPC	Non-player character

References

Atkinson, T., Baier, H., Copplestone, T., Devlin, S., & Swan, J. (2019). The text-based adventure AI competition. *IEEE Transactions on Games*, *11*(3), 260–266. [CrossRef]

Banihashem, S. K., Dehghanzadeh, H., Clark, D., Noroozi, O., & Biemans, H. J. A. (2023). Learning analytics for online game-based learning: A systematic literature review. *Behavior & Information Technology*, *43*(12), 2689–2716. [CrossRef]

Borge Garnaas, H., & van den Tillaar, R. (2024). Implicit versus explicit learning a novel skill for high school students. *Journal of Motor Behavior*, *56*(6), 697–704. [CrossRef]

Børne- og Undervisningsministeriet. (2024). *Vejledning til Læreplan for Historie B til A, hf-e* [Guidance for History B to A Curriculum, hf-e]. Børne- og Undervisningsministeriet.

Byusa, E., Kampire, E., & Mwesigye, A. R. (2022). Game-based learning approach on students' motivation and understanding of chemistry concepts: A systematic review of literature. *Heliyon*, *8*(5), e09541. [CrossRef]

Campitiello, L., Beatini, V., & Di Tore, S. (2024). Non-player character smart in virtual learning environment: Empowering education through artificial intelligence. In F. Palomba, & C. Gravino (Eds.), *Artificial intelligence with and for learning sciences. Past, present, and future horizons* (vol. 14545). WAILS 2024. Lecture Notes in Computer Science. Springer. [CrossRef]

Cao, S., & Liu, F. (2022). Learning to play: Understanding in-game tutorials with a pilot study on implicit tutorials. *Heliyon*, *8*(11), e11482. [CrossRef] [PubMed]

Chen, C.-H., & Chang, C.-L. (2024). Effectiveness of AI-assisted game-based learning on science learning outcomes, intrinsic motivation, cognitive load, and learning behavior. *Education and Information Technologies*, *29*(14), 18621–18642. [CrossRef]

Ciavarro, C., Dobson, M., & Goodman, D. (2008). Implicit learning as a design strategy for learning games: *Alert Hockey*. *Computers in Human Behavior*, *24*(6), 2862–2872. [CrossRef]

Cleeremans, A., Destrebecqz, A., & Boyer, M. (1998). Implicit learning: News from the front. *Trends in Cognitive Sciences*, *2*(10), 406–416. [CrossRef]

de Vero, I., & Barr, M. (2023). A historical text-based game designed to develop critical thinking skills. *International Journal of Game-Based Learning (IJGBL)*, *13*(1), 1–14. [CrossRef]

Dietz, M. (2019). *Spil i historiedidaktisk perspektiv: Med fokus på elevers udvikling af historiebevidsthed*. Aarhus University.

Fenici, M., & Mosca, I. (2023). Gamebooks and branching narratives in education: Fostering sustainability competences to promote positive social change. *Frontiers in Education*, *8*, 1335605. [CrossRef]

Gallotta, R., Todd, G., Zammit, M., Earle, S., Liapis, A., Togelius, J., & Yannakakis, G. N. (2024). Large language models and games: A survey and roadmap. *IEEE Transactions on Games*. [CrossRef]

Jääskä, E., Lehtinen, J., Kujala, J., & Kauppila, O. (2022). Game-based learning and students' motivation in project management education. *Project Leadership and Society*, *3*, 100055. [CrossRef]

Klopfer, E., & Thompson, M. (2020). Game-based learning in science, technology, engineering, and mathematics. In *Handbook of Game-based Learning* (pp. 387–408). MIT Press.

Kunnskapsdepartementet. (2019). *Læreplan i historie fellesfag (HIS01-03)* [Curriculum in history, common core subject (HIS01-03)]. Available online: https://www.udir.no/lk20/his01-03 (accessed on 1 July 2025).

Landro, T. (2020). Historiebevissthet—«allt och inget». In I. Reigstad, & L. K. Jermstad (Eds.), *Fra barnehage til voksenliv—Utdanning, didaktikk og verdi* (pp. 159–176). Novus forlag. [CrossRef]

Li, C., Hou, H., Li, M.-C., & Kuo, C. (2022). Comparison of mini-game-based flipped classroom and video-based flipped classroom: An analysis of learning performance, flow and concentration on discussion. *The Asia-Pacific Education Researcher*, *31*, 321–332. [CrossRef]

Madshaven, J. M., Spanos, A., Omlin, C. W., Reichert, F., & Simonsen, C. R. (2025, March 3–5). *AI-assisted game-based learning in teaching historical consciousness: Benefits and challenges*. INTED2025 Proceedings. 19th International Technology, Education and Development Conference (pp. 4858–4867), Valencia, Spain. [CrossRef]

Mayer, R. E. (2020). Cognitive foundations of game-based learning. In *Handbook of game-based learning* (pp. 83–110). The MIT Press.

Moon, J., Lee, U., Koh, J., Jeong, Y., Lee, Y., Byun, G., & Lim, J. (2025). Generative artificial intelligence in educational game design: Nuanced challenges, design implications, and future research. *Technology, Knowledge and Learning*, *30*(1), 447–459. [CrossRef]

Naseer, F., Khan, M. N., Addas, A., Awais, Q., & Ayub, N. (2025). Game mechanics and artificial intelligence personalization: A framework for adaptive learning systems. *Education Sciences*, *15*, 301. [CrossRef]

Oceja, J., Abián-Cubillo, D., & Torres-Trimallez, M. (2022, October 6–7). *Games for teaching and learning history: A systematic literature review*. 16th European Conference on Games Based Learning (Vol. 16 No. 1. ,), Lisbon, Portugal. [CrossRef]

Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of Game-Based Learning. *Educational Psychologist*, *50*(4), 258–283. [CrossRef]

Plass, J. L., Homer, B. D., Mayer, R. E., & Kinzer, C. K. (2020a). Theoretical foundations of game-based and playful learning. In *Handbook of game-based learning* (pp. 3–24). The MIT Press.

Plass, J. L., Mayer, R. E., & Homer, B. D. (2020b). *Handbook of game-based learning*. MIT Press.

Rastegarpour, H., & Marashi, P. (2012). The effect of card games and computer games on learning of chemistry concepts. *Procedia—Social and Behavioral Sciences*, *31*, 597–601. [CrossRef]

Reber, A. S. (1989). Implicit learning and tacit knowledge. *Journal of Experimental Psychology: General*, *118*(3), 219–235. [CrossRef]

Rüsen, J. (2004). Historical consciousness: Narrative structure, moral function, and ontogenetic development. In *Theorizing historical consciousness* (pp. 63–85). University of Toronto Press.

Seixas, P. (2017). A Model of Historical Thinking. *Educational Philosophy and Theory*, *49*(6), 593–605. [CrossRef]

Skolverket. (2024). *Curriculum for compulsory school, preschool class and school-age Educare—Lgr22*. Skolverket. Available online: https://www.skolverket.se/publikationer?id=13128 (accessed on 5 August 2025).

Song, Y., Wu, K., & Ding, J. (2024). Developing an immersive game-based learning platform with generative artificial intelligence and virtual reality technologies—"LearningverseVR". *Computers & Education: X Reality*, *4*, 100069. [CrossRef]

Spanos, A. (2024). *Introduction to historical consciousness: Textbook for the course HI-139*. University of Agder.

ter Vrugte, J., & de Jong, T. (2017). Self-Explanations in Game-Based Learning: From Tacit to Transferable Knowledge. In P. Wouters, & H. van Oostendorp (Eds.), *Instructional techniques to facilitate learning and motivation of serious games* (pp. 141–159). Springer International Publishing. [CrossRef]

Thorp, R. (2013). *The concept of historical consciousness in Swedish history didactical research* (pp. 207–224). Yearbook of the International Society for History Didactics.

Vicente, L., & Matute, H. (2023). Humans inherit artificial intelligence biases. *Scientific Reports*, *13*(1), 15737. [CrossRef]

Vinter, A., Bard, P., Lukowski-Duplessy, H., & Poulin-Charronnat, B. (2022). A comparison of the impact of digital games eliciting explicit and implicit learning processes in preschoolers. *International Journal of Child-Computer Interaction*, *34*, 100534. [CrossRef]

Wagan, A. A., Khan, A. A., Chen, Y.-L., Yee, P. L., Yang, J., & Laghari, A. A. (2023). Artificial Intelligence-Enabled Game-Based Learning and Quality of Experience: A Novel and Secure Framework (B-AIQoE). *Sustainability*, *15*, 5362. [CrossRef]

Whitton, N. (2010). *Learning with digital games: A practical guide to engaging students in higher education*. Routledge.

Wright-Maley, C., Lee, J., & Friedman, A. (2018). Digital Simulations and Games in History Education. In S. A Metzger, & L. M. Harris (Eds.), *The Wiley international handbook of history teaching and learning* (pp. 603–629). John Wiley & Sons, Inc. [CrossRef]

Yannakakis, G. N., & Togelius, J. (2018). *Artificial intelligence and games*. Springer. [CrossRef]

Zhurakovskaia, I., Vézien, J., de Hosson, C., & Bourdot, P. (2021). Immersive Serious Games for Learning Physics Concepts: The Case of Density. In P. Bourdot, M. Alcañiz Raya, P. Figueroa, V. Interrante, T. W. Kuhlen, & D. Reiners (Eds.), *Virtual reality and mixed reality* (pp. 164–170). Springer International Publishing. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.