A Systematic Review of Examples and the Effectiveness of Game-Based Learning Used To Teach History in K-12 Education

Thomas Bjørner
Aalborg University, Department of Architecture, Design & Media Technology, Copenhagen, Denmark

tbj@create.aau.dk

Abstract: This systematic review is intended to assess the examples and effectiveness of game-based learning (GBL) in teaching history in K-12 education. The review also aims to identify gaps in the current GBL literature and provide future research and development guidelines to improve learning outcomes when incorporating GBL in teaching history. This systematic literature search was conducted using Scopus, focusing on studies that utilized games to address historical teaching in K-12 education. The PRISMA methodology procedure was followed. A total of 688 studies were initially identified, and after the first screening, 360 studies remained. Twelve studies fulfilled the inclusion criteria. The systematic review concludes that games used to teach history in K-12 education vary considerably in content, users, contexts, teacher approaches, and technology. Most of the included studies reveal positive motivational factors when GBL is used. However, only very few studies can provide significant results on the learning outcomes. Most evaluations are based on self-reporting, primarily questionnaires and knowledge tests. Specific learning objectives are rarely included in the games. Future studies could include more participants and other methods to measure the learning effectiveness of GBL.

Keywords: Game-based Learning, History, Systematic Literature Review, K-12 Education, Evaluation, Learning Effectiveness

1. Introduction

Around the world, schools place a high value on teaching pupils and students about history. Through knowledge of countries' histories, pupils can understand their own and other societies. Reading history is a skill with many graduations of proficiency, and learning history is more than names and dates (Wineberg 2001), as it entails inquiry or historical thinking, which calls for using abilities such as perspective-taking, historical analysis, historical comprehension, and argument creation (Craig 2017). However, many pupils have difficulties in history, mainly because the subject can be rather text-heavy and based on the utilization of a teacher-centered teaching approach (Koutromanos et al, 2020).

The PISA 2022 results revealed that, on average, across OECD countries, 26% of students were low performers in reading (OECD 2023). One approach to supplementing the traditional analog reading in history is incorporating game-based learning (GBL). The aim of including GBL is often to improve pupils' engagement and learning about various historical subjects (Baxter et al, 2021; Oceja et al, 2022), making it easier to memorize and understand facts, concepts, time, and historical events. Using games to learn history subjects can also increase interest, make history seem alive, and use technologies such as VR and AR (Rammos and Bratitsis 2019; Ventoulis and Xinogalos 2023). However, history education suffers because the past needs to be demonstrated and experienced directly. Many aspects of games must be suited to history teaching. Games are very good at providing narratives, going back in time to show—and, not least, include—users in historical settings with various interactive elements, with the potential for enhanced experiences with personalized and immersive elements.

GBL can be seen as a teaching supplement to provide continuous motivation for learning, as opposed to motivation loss due to repetitive teaching formats. GBL can complement history teaching, in addition to a range of other established materials such as YouTube clips, film/cinema, documentaries, museum visits, field trips, and festivals. Most literature indicates that GBL can be used to engage and motivate pupils and students in the learning process (Al-Azawi et al, 2016; Bjørner et al, 2022; Bjørner et al, 2023; Chen and Chang 2020; Clark et al, 2016; Karakoç et al, 2022; Lampropoulos et al, 2022), making learning more fun and enjoyable. However, the effects of GBL on specific learning outcomes are diverse and inconclusive (Connolly et al, 2012; Fendt and Ames 2019; Roozeboom et al, 2015; Ventoulis and Xinogalos 2023).

There seem to be significant challenges in measuring the learning outcomes of GBL (Roozeboom et al., 2015). This systemic review will provide an overview of examples and the effectiveness of GBL in teaching history in K-12 education. The research questions are as follows:

1. Which methods are used to evaluate the learning outcomes of implementing GBL to teach history in K-12 education?
2. How effective is GBL for improved learning in teaching history in K-12 education?

Most previous literature revealed that pupils playing historical games are more engaged than pupils receiving traditional instruction. However, it is also important to emphasize that studies on using GBL to teach history have taken place in various contexts, including diverse user groups, school/teaching settings, cultural and geographic contexts, gaming technologies, and use cases, with a wide variety of historical content. This systematic review is intended to assess the examples and effectiveness of GBL in teaching history in K-12 education. The review also aims to identify gaps in the current GBL literature and provide future research and development guidelines to improve learning outcomes when incorporating GBL in teaching history.

The definition of learning outcomes also varies across the literature. For this review, learning outcomes are defined similarly to how Adam (2006 p. 2) describes it: "statements of what a learner is expected to know, understand and/or be able to demonstrate at the end of a period of learning." Learning outcomes are often valued in curriculum development. However, the definition also faces some challenges in defining the end of a learning period. Further complexity is involved in learning at various levels, including interpretations of what a learner is, what is expected, and what it means to understand and/or demonstrate.

2. Methods

2.1 Literature Search Strategy and Exclusions

The electronic bibliographic database Scopus was used for conducting this literature search. The search strategy was based on the following keywords: TITLE-ABS-KEY (game* OR serious game OR game-based learning), AND TITLE-ABS-KEY (history* or cultural heritage) AND TITLE-ABS-KEY (teach*) OR (learn) OR (learning outcomes). To collect the latest studies, each study's publication time was restricted to range from January 2009 to February 2024. The search filter was restricted to history and cultural heritage (by click boxes in Scopus). Further, the identification included that the search included only articles, conference papers, book chapters, and books in English. The search excluded reviews and notes. In case they were not identified during the whole search process, references from Google Scholar, reviews, and systematic reviews were also checked manually for further screening. The PRISMA methodology procedure was followed, with the overview in Figure 1.

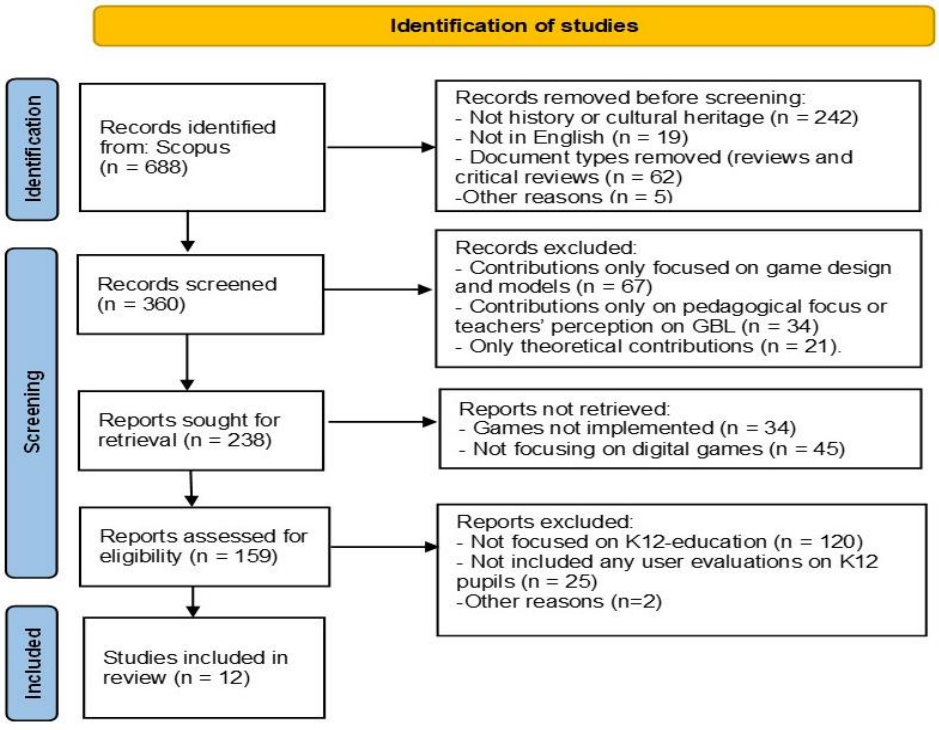

Figure 1: Literature Screening and Selection flowchart

360 records were screened but excluded in the further filtering because the contributions were only focused on game design and models (n = 67), pedagogical focus, or teachers' perceptions (n = 34); for example, the contribution from Andersen (2019), or only theoretical contributions (n = 21). By this filtering, most remaining records provided evaluations of games used in history teaching. However, it is interesting that a substantial

number of contributions (n = 67) include general game design aspects for teaching history but do not include focus on the evaluation. This included, for example, excluded studies such as Azzahra et al, 2023; Ghulamani et al, 2017; Hutson and Fulcher 2023; Ohyama et al, 2020).

For further screening, the educational games need to be implemented, excluding, e.g., contributions with only early-stage low-fi prototype testing (n = 34). This review focuses on digital games, and by that, board games (e.g., Humpire et al, 2022) or other playful learning (for example, roleplaying) were excluded (n = 45). Excluded are studies using simulations (e.g., VR and AR) without game elements, including e.g., the contribution from Efstathiou et al (2017).

The included studies had to be within games used for history teaching in K-12 education. K–12 education is a term that indicates the range of years of supported primary and secondary education, typically ranging from kindergarten to 12th grade. This means that some of the many studies within a high school or university context for teaching history are excluded (n = 120). This includes studies like Ekonomou and Vosinakis 2018. However, an essential aspect of this review was to focus on K-12 education and, within this, also the cognitive abilities for performing various evaluations within this group. Few studies are excluded (n = 25) for being tested at another target group than the game was developed for; this is e.g., the case with the study from Fernes et al, (2023).

2.2 Data Analysis

A predetermined grid was adopted to perform data extraction, including the following information: author, publication year, topic (historical content of the game), game technology (e.g., PC, VR AR), number of participants (sample size), grade and age, setting/ location (context), evaluation methods, and main outcomes. These categories in the grid are like other studies (Oceja et al, 2022), but this study follows more detailed and structured information. The extracted contributions for inclusion were quality assessed by a second reviewer. Because of the high heterogeneity of the studies' measures and the limited articles (n = 12), a narrative synthesis was performed. Meta-analysis was unfeasible to run as the measurement units of each study were not comparable. Therefore, a narrative synthesis was conducted, concentrating on the general characteristics of the included studies.

3. Results

3.1 Overview

As with many other studies in GBL, the number of contributions has increased dramatically (Figure 2). In the literature search for this review (before the screening, n = 688), there were 20 contributions in 2009 - but more than 60 in 2023.

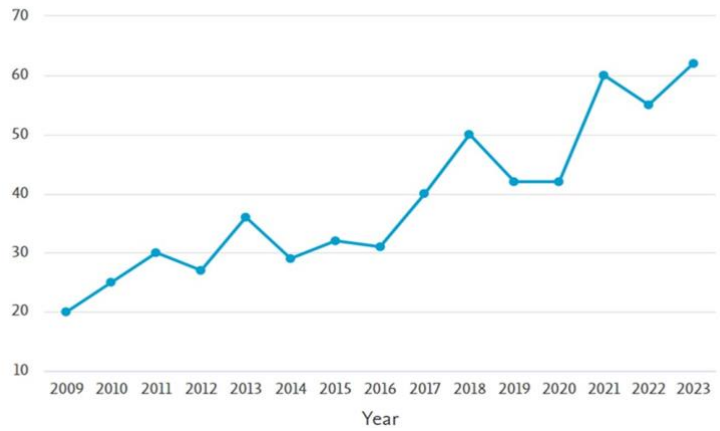

Figure 2: Identified numbers of contributions.

The studies cover various fields, perspectives, and game technologies. Interestingly, most of the contributions are from computer science (29.5%) and social science (24.5%), whereas the contributions from art and humanities are less present (9.5%). Most contributions (92 %) are from conference papers or journal articles.

3.2 The Included Studies

The studies included in this review are listed in Table 1 below.

Table 1: Studies included in the review (n = 12)

Study and Topic	Topic and Game Technology	Participants and Location	Evaluation Methods	Main Outcomes
Huizenga et al, 2009	Historical knowledge of medieval Amsterdam Mobile city game	458 pupils from 20 classes from five schools, Netherlands.	• A quasi-experimental design and grounded theory approach • A/B test, game vs. regular lesson. 10 classes played the game/ 10 classes regular lessons. • Oral reports provided by guides • 110 Observation forms • - 1550 game days were transcribed.	• Pupils who played the game gained significantly • more knowledge about medieval Amsterdam than those with regular instruction. • - No significant differences in the motivation for the history between the A/B group.
Sedano et al,, 2013	Local Finish history Hypercontextualized Game/ Storytelling game	101 pupils, Grade 7 pupils, aged aged 13 and 14, Finland.	• Questionnaires, including • multiple choice and composition questions measuring cognitive and affective engagement.	• significant correlation between (a) fantasy and (b) affective and cognitive engage-ment. • - affective and cognitive engage-ment, through the fundamental ele-ment of fantasy, in the game narrative is essential.
Tegos et al, 2014	The Balkan Wars, World War I, and World War II PC game	34 5th grade pupils. Aged 11 to 12 years old, Greece.	• -Pre/post test design. • Pre-questionnaire followed by (one week later) gameplay. • - Collaboration in dyads to compose a story based on cards from the game.	• Positive opinions about the game.
Chintiadis et al, 2018	Greek Mythology/ Trials of the Acropolis VR game	28 pupils, Greek Schools, Greece	• -Questionnaire, 23 items on a 7-point Likert scale, 3 items on perceived learning. • -Focus group	• Positive opinions about the game. • Making the learning environ-ment natural is essential. • self-reported faster learn
Drosos et al, 2018	El Greco's Travels and Artwork 3D game	20 pupils. Aged 6-15, primary and secondary school, Greece.	• - Questionnaire with 11 items - knowledge quiz for "El Greco" of 7 questions.	• - self-reported increased learning about El Greco – increased

Study and Topic	Topic and Game Technology	Participants and Location	Evaluation Methods	Main Outcomes
				subject interest.

Rammos and Bratitsis 2019	12 Olympic gods
	
	3D game, AR
		24 pupils, 4th grade, Greece.	• Small-scale, qualitative ethnographical study
			• Observations
			  • - Pupils' performance comparison after playing.
				• Pupil performance: 15 improved, 8 the same, 1 worse.
				  • - Positive feedback on using AR that inspired them in creating their narratives.

Fendt and Ames 2019	Battles of Galveston, Texas Civil War
	
	PC game
		33 pupils, 8th grade history Class.
		
		Public middle school, USA
			• A/B test, Game vs. regular lesson (text)
			• pre/post test.
			• 17 pupils played the game, and 16 read the packet
			  • - one-tailed t-test, one-tailed Mann Whitney U test; 5-point Likert scale.
				• No increased learning/ No difference between the game and the text read.
				  • - Increased interest in learning about history and the Civil War through the game.

Koutromanos et al, 2020	The Castle in Naxos, local history.
	
	AR game
		26 pupils, 5th grade, living close to the Castle in Naxos, Greece.	• Qualitative participant evaluation.
			• Interviews with experts
			  • - Evaluation of the pupils' feelings by using work sheets and observation
				• The experts evaluated
				  • the game positively
				• Problems with games in the field.
				• The game was an experiential tool

Remolar, et al, 2021	Ancient Rome
	
	AR game
		75 pupils, se-condary school. ? Spain ?
		
		Experiment 1: 25 pupils aged 12 years old. Experiment 2: 50 pupils, 25 pupils in both the experi-menttal group and the control group.
			• A quasi-experimental design.
			• Experimental group/ Control group.
			• Questionnaire, 5-point Likert scale
			  • - Knowledge test/ no. Of correct answers.
				• Increased interest in studying history
				• greater fixation on
				  • different concepts

Ventoulis and Xinogalos 2023	Greek Mythology.
	
	AR Mini games
		31 pupils, primary school. Greece	• Pre-/post-test design
			• Knowledge test
			• The game experience questionnaire was adopted using the MEEGA+ model.
			  • - Qualitative note-taking and think aloud during gameplay
				• improved perform-ance after playing the game, but no statistical significance.
				• Positively perceived the AR mini-game.
				  • A perceived "learn while playing".

Petersen et al, 2023	Bombardment of Copenhagen in 1807 PC game	22 pupils, aged 13 or 14. Elementary school, Denmark.	• A/B test, Game vs. regular lesson (text), • Experimental group (11 pupils)/ control group (11 pupils). • knowledge test • Questionnaire with engagement items • Semi-structured interviews • - No significance test	• Higher under-standing of specific learning objectives in the experimental gaming group compared to the control group • High perceived perceived intuitiveness and

Study and Topic	Topic and Game Technology	Participants and Location	Evaluation Methods	Main Outcomes
				clarity for the game. • - positive per-ceptions of clarity in the game's narrative.
Carrascosa et al, 2024	Historical events in relation to BC and AD AR game/ gamification	76 pupils. Intervention 1: 19 pupils, 5th grade. Intervention 2: 57 pupils, 2nd and 3rd year, secondary school, Spain.	• Intervention 1: Quasi-experimental pre-post design. Single treatment • group. • Intervention 2: Experimental pre-post design, with a control group and experimental group. Experimental group (29 pupils)/ Control group (28 pupils). • -Knowledge test pre/post • -Motivation and usability, 16 items, 5-point Likert scale. • - No significance test	• AR with gamification improves learning outcomes • - Positive impact on motivation and emotions.

Despite the relatively strict screening, the results from the 12 included studies are rather heterogeneous. The included contributions range from 2009 to 2024, during which there has been considerable technology development, with more recent (from 2018) included VR and AR studies. Notably, the contributions rarely do not include the novelty effect – with the potential that the pupils have the most robust response the first (or second) time they play the game, and by that, the studies can face potential bias for both the learning effectiveness and engagement.

Some studies involve games played at school, whereas others are outdoors on site (Huizenga et al, 2009; Koutromanos et al, 2020). Outdoor games can be affected by weather conditions, making them difficult or impossible to play at certain times of the year. There can also be problems with Wi-Fi connections, as already highlighted in the study by Koutromanos et al. (2020).

The topics in the contributions are very different, though a majority (8 out of 12) of the studies include ancient or medieval history. Most of the participants included in the contributions are between the ages of 11 and 14. Like other GBL research, the studies have very different numbers of participants. The highest number of included participants is 458 pupils (Huizenga et al, 2009), followed by 101 students (Sedano et al, 2013). 8 out of 12 studies are included with 20-35 participants.

Several studies are within an A/B test set up for measuring the differences in the game use and regular lessons with analog text read (e.g., Huizenga et al, 2009; Fendt and Ames 2019; Petersen et al, 2023). Six studies are included as a quasi-experimental study and have included both an experimental and control group. Questionnaires are often combined with qualitative methods (interviews, focus groups, observations, note-taking, think-aloud). Two studies are found with an only qualitative approach (Rammos and Bratitsis 2019; Koutromanos et al, 2020).

Interestingly, almost all studies found increased motivation and/or engagement by using GBL in historical teaching, except for Huizenga et al, 2019. Most of the studies also found positive effects on learning, but there were considerable differences in how learning is defined and how the teachers were involved in the learning. Only very few studies can provide significant results (Huizenga et al, 2009; Sedano et al, 2013) on the learning outcomes. Few studies also reported no difference in learning by using GBL (e.g., Fendt and Ames 2019).

4. Conclusion

As with many other studies in game-based learning, most of the studies included in this systematic review reveal positive perceptions about the included games used and an increased motivational factor for learning history. The novelty of this systematic review is a specific focus on game-based learning for teaching history in K-12 education and a focus on the methods used to evaluate the learning outcomes. The most common methods

used to evaluate learning outcomes of GBL in history for K-12 education are self-reported questionnaires and knowledge tests, often as pre-/post-tests. The knowledge test questions are often direct questions related to the learning content provided by the game, thus putting more emphasis on these exact questions. Most studies include rather few participants. Within the included studies for this systematic review, only two studies have more than 100 participants included. Longitudinal studies are absent.

The included studies highlight educational and learning objectives very differently. Analyzing the complex relations between topic, context of use, user groups, technological solutions, and number of participants is still a significant challenge for providing profound results in learning effectiveness via GBL in history teaching in K-12 education. Some studies reveal that pupils who used game-based learning gained significantly more knowledge about history than those with regular instruction. Other studies showed no increased learning effect by using game-based learning. However, it is complicated to compare these studies, and one should be careful not to conclude too quickly regarding learning outcomes across studies. Notably, specific learning objectives are rarely included in the games. The topics and the settings are also very different across studies, and even within the same studies, settings vary between the included experimental groups, making it difficult to repeat the studies.

For future works, it would be very beneficial if more studies included more participants to provide statistically profound results. It could also benefit if more studies used randomization, meaning that the participants are grouped by chance—either being randomly assigned to the intervention (game-based learning) or the control group (traditional teaching). It is also worth highlighting that studies should always be transparent in the research design and sampling methods.

When evaluating GBL for pupils in K-12 education, it is essential not to neglect the challenges of finding the right match between participants' cognitive abilities and a solid methodological approach. We need to challenge and reflect more on the methods used. For example, it is worth discussing if the suitable method is to use a 5- or 7-point Likert scale for kids aged, e.g., 11-12 years old, in terms of motivation and understanding the questions and scaling. Future studies could include more advanced and novel methods for incorporating improved methods to measure the learning effectiveness of GBL. Future studies could include more participants and variables such as gender, genre motivation, text expectations, and specific reading differences between analog and digital text.

References

Adam, S. 2006. *An Introduction to Learning Outcomes*. Princeton, NJ: Citeseer.

Al-Azawi, R., Al-Faliti, F., Al-Blushi, M. (2016) "Educational gamification vs. game-based learning: Comparative study", *International Journal of Innovation, Management and Technology*, Vol. 7, No. 4, pp. 132-136.

Anderson, S. L. 2019. "The interactive museum: Video games as history lessons through lore and affective design2, *E-Learning and Digital Media*, Vol. 16, No. 3, pp. 177-195.

Azzahra, W., Wahyudin. M. (2023) "Compustory: A Virtual Museum Game for Modeling the History of Computer Evolution", In: Badioze Zaman, H., et al. *Advances in Visual Informatics*. IVIC 2023. Lecture Notes in Computer Science, Vol 14322, pp. 161-174.

Baxter, G., Hainey, T., Savorelli, A., Akhtar, U., Ivanova, R.R. (2021) "Teaching history and bringing the past back to life with serious games", In: Proceedings of the 15th European Conference on Game Based Learning (ECGBL), pp. 99–107.

Bjørner, T., Sum, A.J., Ludvigsen, R.K., Bouquin, N.L., Larsen, F.D., Kampel, U. (2022) "Making homework fun: the effect of game-based learning on reading engagement", In: Proceedings of the 2022 ACM *Conference on Information Technology for Social Good*, Association for Computing Machinery, New York, NY, USA, pp. 353–359.

Bjørner, T., Blume, N. B., Frederiksen, N. J., Hjort, V. S., Mørck, A. F., Petersen, M. Ø. (2023) "An Engaging Serious Game that Strengthens High School Students' Understanding of the Periodic Table", In *International Conference on Games and Learning Alliance.* Cham: Springer Nature Switzerland, pp. 3-12.

Carrascosa, C. L., Ylardia, I. P., Paredes-Velasco, M., García-Suelto, M. D. C. N. (2024) "Game-Based Learning With Augmented Reality for History Education," IEEE *Revista Iberoamericana de Tecnologias del Aprendizaje*, Vol. 19, pp. 14–23

Chen, S.Y., Chang, Y.M. (2020) "The impacts of real competition and virtual competition in digital game-based learning", *Computers in Human Behavior*, Vol. 104: 106171.

Clark, D.B., Tanner-Smith, E.E., Killingsworth, S.S. (2016) "Digital games, design, and learning: a systematic review and meta-analysis", *Review of Educational Research*, Vol. 86, No. 1, pp. 79–12.

Connolly, T.M., Boyle, E.A., MacArthur, E., Hainey, T. and Boyle, J.M. (2012) "A systematic literature review of empirical evidence on computer games and serious games", *Computers & education*, Vol. 59, No. 2, pp.661-686.

Craig, K. (2017) "Analog tools in digital history classrooms: An activity-theory case study of learning opportunities in digital humanities", *International Journal for the Scholarship of Teaching and Learning*, Vol. 11, No. 1, n1.

Drosos, V., Alexakos, C., Alexandri, A., Tsolis, D. (2018) “Evaluating 3D serious games on cultural education”, In Proceedings of the *9th International Conference on Information, Intelligence, Systems and Applications (IISA),* pp. 1-5, IEEE.

Ekonomou, T.; Vosinakis, S. (2018) “Mobile augmented reality games as an engaging tool for cultural heritage dissemination: A case study”, Scientific Culture, Vol. 4, No. 2, pp. 97-107.

Efstathiou, I.; Kyza, E.A.; Georgiou, Y. (2017) “An inquiry-based augmented reality mobile learning approach to fostering primary school students’ historical reasoning in non-formal settings”, Interactive Learning Environment, Vol. 26, No. 1, pp. 22–41.

Fendt, M. W., Ames, E. (2019) “Using learning games to teach Texas civil war history to public middle school students”. In *2019 IEEE Conference on Games (CoG*), pp. 1-4). IEEE.

Fernes, D., Oberdörfer, S., Latoschik, M. E. (2023) “Work, Trade, Learn: Developing an Immersive Serious Game for History Education”, In *International Conference on Immersive Learning,* pp. 379-396. Cham: Springer Nature Switzerland.

Ghulamani, S., Shah, A., Khowaja, K. (2017) “Development of a game for history course of secondary school students”, In *2017 4th IEEE International Conference on Engineering Technologies and Applied Sciences (ICETAS*), pp. 1-7. IEEE.

Humpire, J. A., Vidal, M. G., Moina, M. T., Colque, M. V., Sulla-Torres, J. (2022) “Battle Card, Card Game for Teaching the History of the Incas Through Intelligent Techniques”, *Intelligent Computing*, Vol. 508, pp. 331-346.

Hutson, J., Fulcher, B. (2023) “A virtual reality educational game for the ethics of cultural heritage repatriation”, *Games and Culture*, Vol. 18, No. 6, pp. 759-782.

Huizenga, J., Admiraal, W., Akkerman, S., ten Dam, G. (2009) "Mobile game-based learning in secondary education: engagement, motivation and learning in a mobile city game." *Journal of computer assisted learning* Vol. 25, No. 4, pp. 332-344.

Karakoç, B., Eryılmaz, K., Turan Özpolat, E., Yıldırım, İ. (2022). “The Effect of Game-Based Learning on Student Achievement: A Meta-Analysis Study,” *Technology, Knowledge and Learning*, Vol. 27, No. 1, pp. 207–222.

Chintiadis, P., Kazanidis, I., Tsinakos, A. (2018) “Trials of the Acropolis: Teaching Greek Mythology Using Virtual Reality and Game Based Learning,” Interactive Mobile Communication Technologies and Learning, Vol. 725, pp. 247–257.

Koutromanos, G., Pittara, T., Tripoulas, C. (2020) “‘Clavis Aurea’: An augmented Reality Game for the Teaching of Local History,” European Journal of Engineering Research and Science, Dec. 2020

Lampropoulos, G.; Keramopoulos, E.; Diamantaras, K.; Evangelidis, G. (2022) “Augmented Reality and Gamification in Education: A Systematic Literature Review of Research, Applications, and Empirical Studies”, Applied Sciences, Vol. 12, No. 13, p. 6809.

Oceja, J., Abián-Cubillo, D., Torres-Trimallez, M. (2022) “Games for teaching and learning history: a systematic literature review”, In: European Conference on Games Based Learning, Vol. 16, No. 1, pp. 419–430.

OECD (2023), *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/53f23881-en.

Ohyama, M., Baba, H., & Yoshinaga, J. (2020, October). Construction of Debriefing Designed for Applying Experiences of History Game to Contemporary Issues. Joint International Conference on Serious Games, Lecture Notes in Computer Science, Vol. 12434, pp. 263-275.

Petersen, M. S., Bjørner, T., Arndt, C. T., Safi, O. (2023) “How a Serious Game Supports Elementary School History Classes in Teaching About the Bombardment of Copenhagen in 1807”, Joint International Conference on Serious Games, *Lecture Notes in Computer Science,* Vol. 14309, pp. 301-313.

Rammos, D., Bratitsis, T. (2019) “Alternative Teaching of History Subject in Primary School: The Case of the 3D HIT Playful Activity”, In: Liapis, A., Yannakakis, G., Gentile, M., Ninaus, M. (eds) Games and Learning Alliance. GALA 2019. *Lecture Notes in Computer Science*, Vol. 1899, pp. 457–467.

Remolar, I., Rebollo, C., & Fernández-Moyano, J. A. (2021) “Learning history using virtual and augmented reality”, *Computers*, Vol. 10, No. 11, p. 146.

Roozeboom, M.B., Visschedijk, G., Oprins, E. (2015) “The effectiveness of three serious games measuring generic learning features”, *British Journal of Educational Technology*, Vol. 48, No. 1, pp. 83–100.

Sedano, C. I., Leendertz, V., Vinni, M., Sutinen, E., Ellis, S. (2013). “Hypercontextualized learning games: Fantasy, motivation, and engagement in reality”, *Simulation & Gaming*, Vol 44, No. 6, 821–845.

Tegos, S., Kioumousidou, M., Vavami, M., Kioutsiouki, D., Gkoumas, D., Tsiatsos, T. (2014) “HistoryLand: A Serious Game for History Learning in Primary Education”, In *European Conference on Games Based Learning*, Vol 2, pp. 838-842. Academic Conferences International Limited.

Ventoulis, E., Xinogalos, S. (2022) “AR The Gods of Olympus: Design and pilot evaluation of an augmented reality educational game for Greek mythology”, *Multimodal Technologies and Interaction*, Vol 7, No. 2:2.

Wineburg, S. (2001) *Historical thinking and other unnatural acts: Charting the future of teaching the past,* Temple University Press, Philadelphia.