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## A Virtual Reality Educational Game for the Ethics of Cultural Heritage Repatriation

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# A Virtual Reality Educational Game for the Ethics of Cultural Heritage Repatriation

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## Abstract

The technology of virtual reality and the gamification of education has had proven educational benefits and has the ability to immerse students in a participatory learning experience. To capitalize on the strengths of the new digital medium, including immersion, engagement, and presence, a new educational game aims to teach the ethics of cultural heritage repatriation through the lens of art history. The use of games to address current issues and conceptualize a framework for understanding the complexities of geopolitics is not new but aligning these considerations with the pressing need to protect cultural heritage as seen in modern-day Ukraine is. This study investigates the process of game design and development from preproduction to postproduction. The final version of *The Museum of the Lost* provides a model for other institutions with game design and art history departments to collaborate and create educational experiences that optimize the user experience and learning outcomes.

## Keywords

virtual reality, art history, gamification, repatriation

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## Introduction

The gamification of everything is now. The cross-pollination of gaming and all areas of experience has been driven by gaming development technology in recent years and ease of access for users with a variety of backgrounds. The gamification of mobility, entertainment, business software, education, and everything else can be contributed to the demonstrably superior method for content delivery and engagement. Specific to education, learning is more engaging when entertaining, as well as having goals and targets to achieve. Examples of this may be seen on sites such as Khan Academy and applications like Duolingo. These gaming technologies and methodologies are now infiltrating the virtual classroom, though primarily at the secondary level (Hosseini-Mohand et al., 2021; Papadakis & Kalogiannakis, 2017). However, despite recent technological advances and the new participatory, digital culture that pervades the lives of students at all levels, traditional education has remained largely unchanged. The role played by the gamification of education and experienced through virtual reality (VR), naturally lends itself to and is emblematic of this new participatory culture. Dastyar (2019) confirms that the role played by motivating factors works in tandem with participatory learning to improve both motivation and academic achievement. The act of gaming and gaming communities rely on similar factors. For example, gaming moves players/students beyond passively consuming media/information to actively participate and produce an experience through their interaction with the game itself and other players (Squire, 2011). At the same time, the role played by VR, which has been used to support educational materials since the 1990s (Biocca & Levy, 1995), can magnify the motivation and learning outcomes when coupled with gamifying the learning experience. Research has confirmed that virtual learning environments are able to “stimulate learning and comprehension, because it provides a tight coupling between symbolic and experiential information” (Bowman et al., 1998, p. 121). Not only are immersive realities well-suited to experiential learning, but studies have also found improved time-on-task (Huang et al., 2010; Johnson et al., 1998), increased enjoyment of learning (Apostolellis & Bowman, 2014; Ferracani et al., 2014), motivation (Brownridge, 2020; Cheung et al., 2013; Jacobson et al., 2005; Sharma et al., 2013), deeper learning, and long-term retention (Huang et al., 2010; Hussein & Nätterdal, 2015; Rizzo et al., 2006).

To leverage the participatory nature of games and the immersive capabilities of VR for the purposes of education, a team comprised of game designers, coders, and art historians created a game to investigate ethics associated with the protection of international cultural heritage and repatriation of looted or stolen works of art. The use of games to address current issues and conceptualize a framework for understanding the complexities of geopolitics is not new—*Fantasy Geopolitics*, *Geopolitics Boardgame*, *Ultimatum*, and *Spheres of Influence* are but a few examples. However, aligning these considerations with the pressing need to protect cultural heritage has hitherto not been investigated even with failures to protect said heritage continue to mount, including looting of Iraqi museums during the Iraq War in 2003, Islamic

State in Iraq and Syria destroying statues and monuments in Syria during their occupation from 2016 to 2017, and, most recently, the destruction of historical monuments by Russian in Ukraine, starting in 2022 (Bogdanos, 2005; Coleman et al., 2022; Cunliffe & Curini, 2018). International law protecting cultural heritage during wartime was put in place as a result of the losses experienced in the 19th and 20th centuries, however, protection and repatriation are still debated. For instance, the Belgian King recently returned a mask to the Congo but failed to apologize for the treatment of the Congolese under Belgian rule (Maclean & Peltier, 2022). At the same time, the British continued to refuse to return the Elgin Marbles in the British Museum to Greece (Vasilias, 2022) and the Germans refused to return the Bust of Nefertiti in the Neues Museum to Egypt (Bearden, 2012). The considerations go beyond cultural ownership and include ethics. The use of VR to teach ethics has been well established in the medical and environmental studies but has yet to be used to address that in the topic under investigation in this study (Liu et al., 2019; Sholihin et al., 2020; Torda, 2020).

In order to address the complexities of issues facing those who have artifacts from other nations, and the ethics behind cultural ownership, Lindenwood University, St. Charles, Missouri, developed the educational VR video game *The Museum of the LostVR*. The game serves to show ethical concerns of repatriation and the legacy of colonialism in tandem with educational knowledge of art history and is currently available via Itch.io (<https://bfulche.itch.io/museum-of-the-lost-vr>). The use of immersive learning environments in VR serves as an important element to further engagement and impact in educational gaming, which will be further discussed in the literature review. The immersive platform also serves to increase the sense of presence and engagement in the ethical concerns presented to players which are central to the educational purpose of the game. Three levels provide an historical overview of cultural heritage protection and repatriation laws, while presenting ethically ambiguous decisions to be made by the player, reflecting the complexities of issues facing individual collectors, museums, governments, and nations today. Inherent in the game itself are questions about art collections and art ownership, along with an understanding of how certain countries refuse to return some important art pieces to the countries they colonized. This study outlines the process of game design and development from pre-production to postproduction taken by the interdisciplinary team. Results from play-testing surveys are discussed and how the design and development team implemented the feedback in order to measure participatory behavior in the game to determine ethical behavior. The final version of *The Museum of the Lost* provides a model for other institutions with game design and art history departments to collaborate and create educational experiences that optimize the user experience and learning outcomes.

## Literature Review

The use of educational games and gamification instruction has received more attention as a means to engage learners across various demographics, backgrounds, and cultures

(Kim et al., 2018). The role of educational gaming provides a powerful tool for educators to support their instructional goals. As with the game under investigation in this study, using such strategies to teach ethics has been well-studied (Lloyd & Van De Poel, 2008; Schrier, 2014). While game-based instruction is not new, the adoption of recreational gaming for a broader demographic coupled with the ubiquitous availability of technologies has accelerated the exploration and application of such games for educational purposes (Wideman et al., 2007). Coupled with the recent advancements in VR technology, educational gaming is poised to engage students in the new participatory, digital age. In the field of education, gamification has great potential for learner engagement. Educators have struggled with engagement and interest in the classroom and have tried numerous approaches, such as the use of various motivational strategies. These interventions last, unfortunately, only a short time, but the gameplay has the ability to sustain attention and engagement for longer periods (Kim et al., 2018). The mechanisms by which a player experiences the game are also of utmost concern for our review.

### *Virtual Reality and Video Games*

Gamification and video games can be used to support teaching and learning. At the same time, the manner in which a learner engages with the content of the game, especially with video games and hardware and software considerations, may further determine the educational impact. When coupled with game-based instruction, VR has the ability to more fully immerse learners in environments to better understand course content. However, while the gamification of learning and education has a long history, there were significant budgetary and technological constraints that have limited the use of VR for education and gamification (Khaitova, 2021). In fact, VR has only recently become a commercially viable hardware option for consumers in general and video games paved the way. The first attempt at the commercial promotion of VR can be attributed to second-generation video game consoles beginning in 1993. Several video game studios developed software and applications for VR head-mounted displays (HMD). However, both SEGA (1993) and Nintendo (1995) experienced commercial failure with the endeavor (Horowitz, 2004; Kushner, 2014). In fact, the first headset that could be considered commercially viable did not release until 2013 with the Oculus Rift. While the HMD was originally designed for the video game market, the unit could also support educational applications (Moorefield-Lang, 2015). The latest generation of headsets, led by the Oculus Quest 2, has overcome the limitations outlined by Kavanagh et al. (2017): user experience, accuracy, cost, and consumer availability. Whereas earlier educational VR games were confined to Computer Science labs tethered to special desktop units, the latest all-in-one headsets are ensuring broader distribution of educational applications through platforms such as STEAM, Itch.io, and Oculus App Lab.

## Virtual Reality and Gaming in Art History Education

Interest in studying arts and culture through the lens of technology has increased as of late and art history games are poised to offer broader engagement for the public. [Champion and Foka \(2020, p. 239\)](#), for instance, outlined four areas that such games could achieve, including (1) encouraging an understanding of the classification of art, (2) identification of art and matching those to their respective artists, (3) provide an understanding of how artworks are constructed and conserved, and/or (4) communicate the “spatial, chronological, personal and social context in which art is created and experienced.” With the ability to effectively transport students to any site in the world, including world culture heritage locations and museums, immersive realities are ideally suited to understanding the context of a work. Through conveying critical changes in time, space, or behavior through interaction and sensory immersion, these games can create thematic conceptual experiences that are themselves framed by contextual meaning. The field has already adopted emerging technologies to investigate cultural artifacts. Taking cues from the art world itself, art historians disseminate reproductions of works first through printmaking and then through projections with magic lanterns. The modern age saw the rise of the slide carousel projector and now the ubiquitous ceiling-mounted liquid crystal display (LCD) projector in classrooms across the world today. Art history has always sought out the most immersive methods to bring works to students. Furthermore, the ability of these emerging technologies to preserve, represent, and disseminate cultural heritage has received much attention in digital humanities scholarship ([Addison & Gaiani, 2000](#); [Adhani & Rambli, 2012](#); [Anthes et al., 2016](#); [Bekele et al., 2018](#); [Papagiannakis et al., 2018](#)). But unlike the earlier technologies listed above, VR is not primarily a passive information delivery system. VR and gaming have the unprecedented educational ability to dynamically engage students and educators in a simulacrum. The three characteristics that act in concert to provide such an experience are outlined by [Bekele and Champion \(2019, p. 31\)](#) as the ability to: “(1) establish a contextual relationship between users, virtual content, and cultural context, (2) allow collaboration between users, and (3) enable engagement with the cultural context in the virtual environments and the virtual environment itself.” The features afford users the ability to engage with the experience, other users, and a deeper understanding of the context of the relationship between the three in a virtual environment.

A point should be made, here, between games proper and simulations. Many of the examples cited above are, in fact, simulations in that they differ from games that have roles, goals, and agencies. In fact, many of the art games studied are simulations, such as *The Forbidden Palace: Beyond Space and Time*, *Rome Reborn*, *Digital Pompeii Unity*, and *Virtual Rome* ([Champion & Foka, 2020](#)). On the other hand, in *Civilization* (1991–), for instance, players have the role, such as that of a leader, and a goal, which could be to advance your people, and agency in that decisions affect the outcomes of the game at large made by the player. On the other hand, simulations generally have a preordained series of experiences meant to effectively replicate or

inform of a given experience, such as how to drive a tank or a cinematic of the Pyramids of Giza (Squire, 2011). Both are valuable learning experiences depending on the outcome desired.

While two-dimensional (2D) level design and side-scrolling platformers dominated when *Civilization* and other educational games first emerged, a shift toward greater and greater immersion has unfolded. After the parallax effects of 2D games, such as *Prince of Persia* (1992), the isometric design was developed for massively multiplayer online games like the *World of Warcraft* series (1994–), which found that the player hovering above a surface on which characters engage with the environment. The manner in which the player engaged with characters in the game gave way to a first-person point of view popularized in first-person shooters like *Doom* (1996–) and spread to nearly all video game genres. The shift in perspective and design is indicative of the overall trend to make personal computer video games mimic the immersive qualities of VR (Wolf & Perron, 2003).

Such immersiveness is increasingly being applied to arts education. For instance, the virtual museum Huaman, Aceituno, and Sharhorodska developed further demonstrates the benefits of gamification in the field. Similar arguments are made by Froschauer et al. (2011) with their online multiplayer serious game *ThIATRO*. The project grew out of a need to address the tedious manner in which students perceive the learning of art history. The sheer amount of rote memorization in each class, along with the context of cultures over time, represents a steep learning curve for many students. At the same time, the very element that thwarts engagement can be made into an asset as the cultural–historical background of art history can play an important role in raising a student’s interest in contemporary culture and cultural heritage. *ThIATRO* is a multiplayer game that engages digital natives in a gamified manner to increase motivation and learning outcomes. Like other games, such as *ARTé: Mecenas*, *ThIATRO* compels the player to think about, organize, and use information in ways that encourage the active construction of knowledge, as well as to collaborate with others. Another project by Casu et al. (2015) sought to leverage the lower cost of consumer hardware in developing an application for the teaching of art history. *Art Thief* is another example of a game created at the California Institute of the Arts (2017) for the CalArts Game Makers Club. In this scenario, role playing game (RPG), a young security guard named Olive must fend off an art thief in a museum, while simultaneously interacting with the museum staff and visitors to solve puzzles, etc. Unfortunately, the 2D game is limited in its interactions and is not as engaging as the immersive content to be discussed (Champion & Foka, 2020).

## Game Overview

The educational game *The Museum of the LostVR* was designed in the Unity game engine with game mechanics to cast the player in an ambiguous role. In order to address the complexities of issues facing those who have artifacts from other nations and peoples, and the ethics behind cultural ownership, the player is prompted

to collect specific works of art in three areas of a museum that serves as a weigh station for stolen or looted works to be transported elsewhere. Guards patrol all areas of the museum with flashlights. The player must avoid the guards using a stealth gameplay mechanic; if a guard's flashlight collides with the player's character/XR Rig, the player respawns at the start of that level. As works are collected, a user interface (UI) element removes them from the list in the repository, which is a crate for shipping works, on each level. Once all specified works are collected per level, the player must successfully complete a quiz over the material covered on the history and legality of repatriation of cultural heritage.

Three levels provide an historical overview of cultural heritage protection and repatriation laws, while presenting ethically ambiguous decisions to be made by the player, reflecting the complexities of issues facing individual collectors, museums, governments, and nations today. The Main Menu (Figure 1) launches audio and an overview of the museum to introduce "What is a Museum?" The audio clip introduces the nature of global or encyclopedic museums and the nature of collecting objects from all geographical areas and chronological periods of human history. The checkered pasts of many objects in museums are introduced before the player spawns in the first level.

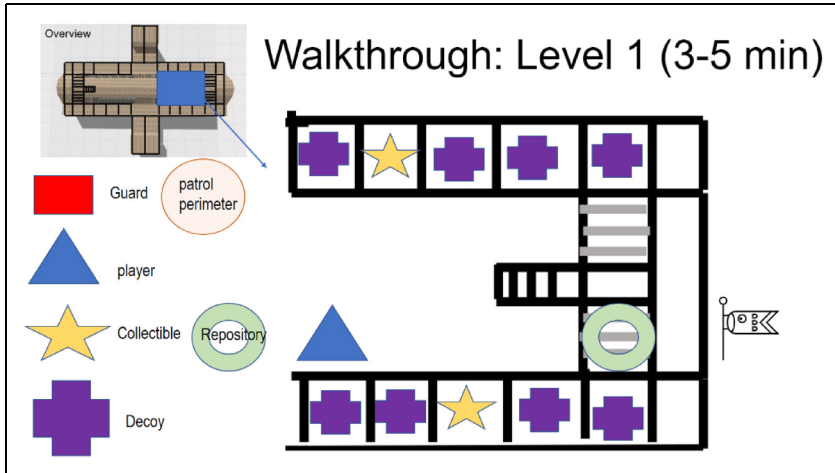
### *Level 1: The Hall of War*

Level 1 is titled "The Hall of War: To the Victor Go the Spoils" (Figure 2) and showcases works looted during the 19th and mid-20th centuries during the Napoleonic Wars (1803–1815), European colonization of Africa (1833–1905), and



**Figure 1.** Main Menu.

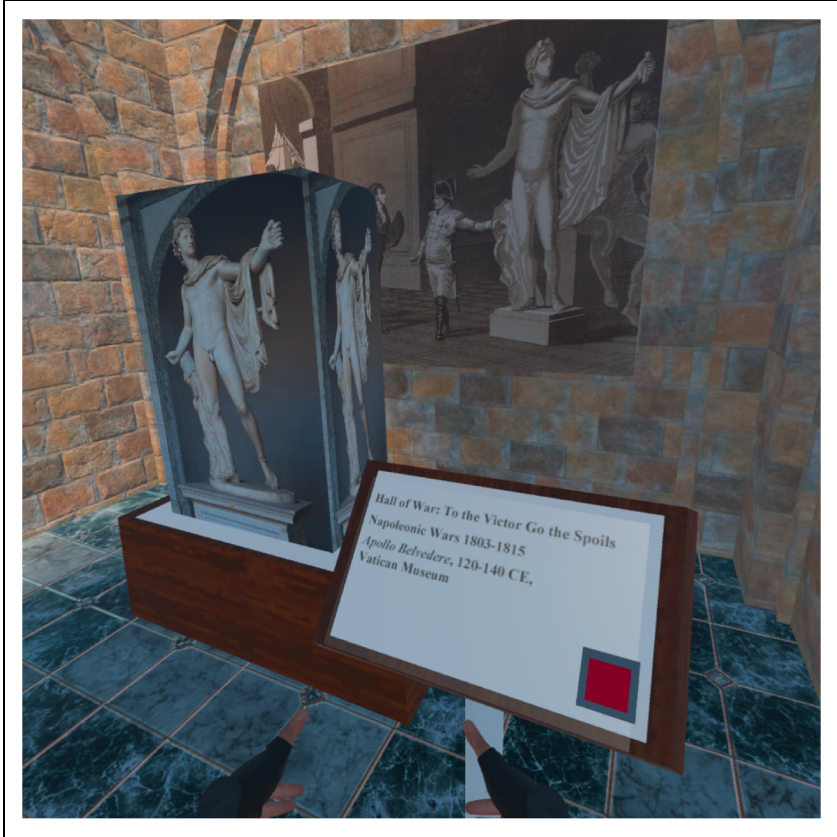




**Figure 2.** Pitch Deck Walkthrough of Level 1.

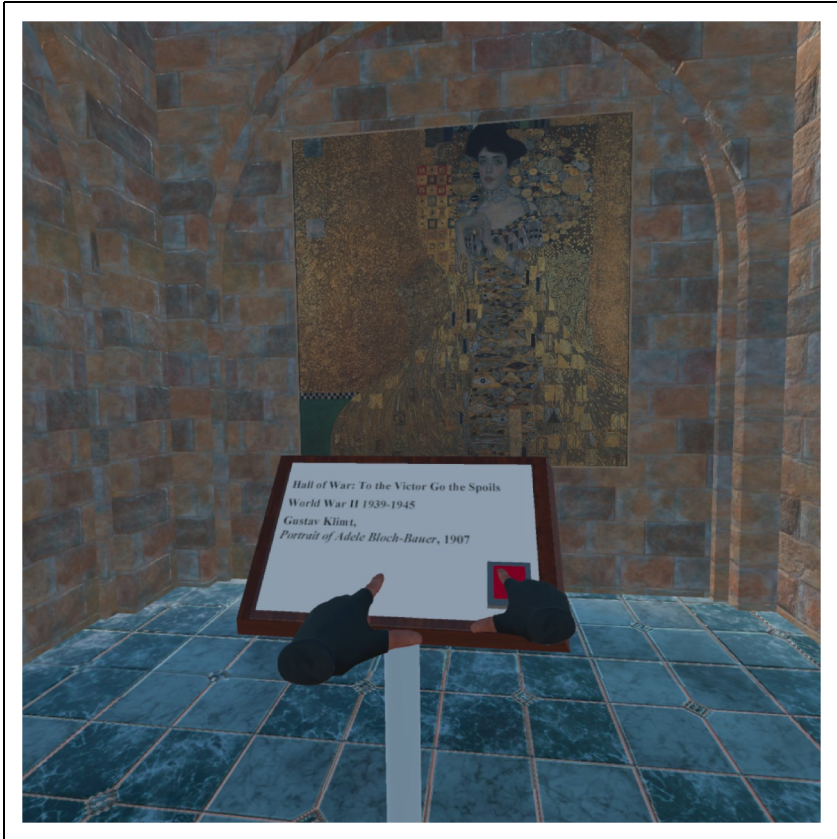
World War II (1939–1945). In Level 1, the guards are not physically present; the radiating beams from their flashlights pan across the floor of the museum, which the player must avoid in order to progress in the level. Each time the light hits the player, they are respawned at the beginning. Crates for packing and unpacking stolen works of art litter the entire museum and provide cover for the player attempting to avoid detection. The player starts with works looted by Napoleon throughout Europe and his archeological expedition to Egypt, leading to the establishment of the Napoleon Museum in the Louvre in Paris (Herman, 2020). Works are housed in individual niches with accompanying historical prints and/or photographs and a pedestal with identifying information and a red button (Figure 3). Pressing the button for each work triggers a short audio clip providing additional context to the work being viewed. Works in the Napoleonic section of the hall include *The Rosetta Stone*, *Apollo Belvedere*, and *Horses of San Marco*. All images were used to skin primitives in Unity as Joint Photographic Experts Groups (JPGs) and were in the public domain housed on Wikimedia Commons—[https://commons.wikimedia.org/wiki/Main\\_Page](https://commons.wikimedia.org/wiki/Main_Page). Next, the colonization of Africa is discussed with the case of the Benin Bronzes. The 1907 Hague Convention provides context for the player to understand the result of such activities. The convention forbade the plundering of any kind during an armed conflict but failed to address cultural heritage or works of art specifically (Eyffinger, 2007).

Once the player has collected all works from the north side of the hall and deposited the works in the repository, they are directed to the south side and the events of World War II. A brief overview of the Holocaust and the 650,000 works looted by the Nazis across Europe is provided (Masurovsky, 2019). Historical photographs along the back wall provide context for the Führermuseum planned for Linz, Austria to house the greatest collection to be assembled on the continent (Soloshenko, 2021). Examples



**Figure 3.** Level I: Hall of War: *Apollo Belvedere*.

of work looted, stored in salt mines, and many subsequently lost are provided, such as *Painter on His Way to Work* by Vincent van Gogh of 1888 (McLaughlin, 2021). While the work by van Gogh was never recovered, the Monuments Men (1943–1951) are introduced who were able to recover other works in salt mines, such as that at Stassfurt near Magdeburg. The group of American and British curators, architects, artists, art historians, and librarians traveled Europe attempting to catalog and recover looted or stolen works by the Nazis (Saxon & Buchanan, 2021). The legal battles to reclaim works taken from Jews across Europe are then discussed with the examples of the *Portrait of Adele Bloch-Bauer* by Klimt in 1907 (Figure 4) and *Portrait of Wally Neuzil* by Schiele in 1912 (Gravenstein, 2022). Much as with the conclusion of the north hall, the 1954 Hague Convention is then discussed to provide further insight into cultural heritage law. The convention was built on the 1907 Hague Convention by specifically addressing protections for cultural heritage during



**Figure 4.** Level 1: Hall of War: *Portrait of Adele Bloch-Bauer*.

armed conflict (Pantazopoulos, 2022). With the deposit of the last work in “The Hall of War,” a UI element triggers a quiz that players must complete before moving on to the next level. The quiz is randomized and has multiple questions for each topic to be covered to ensure a unique experience for different players.

### *Level 2: Halls of Ownership & Looting*

Level 2 further investigates the complexities of cultural heritage law and is aptly titled “The Hall of Ownership.” The level is located along the north wing on the second level of the museum and starts by climbing a staircase from Level 1. The player is spawned in the middle of the staircase directly under an enlarged still from the movie *Black Panther* (2018) where the character Killmonger observes African artifacts in a fictitious British museum. The arguments for repatriation are presented in an audio clip

that is automatically triggered upon spawning. With the looting of Black culture from Africa as a backdrop, the arguments most frequently used by those who demand the return of their cultural patrimony are presented and include: the moral obligation to return to rightful owners; cultural objects belong with the cultures that created them as they are part of their political and cultural identity; not returning objects reinforces colonialist ideologies; global museums are mostly in the industrialized north, and thus inaccessible to the cultures that created the works they display (Ezuluomba, 2021). Using stacked crates along the corridor, the player must avoid the guards that are now visible and physically present (Figure 5). The case of the Elgin Marbles (Phidias(?), Parthenon sculptures, frieze: 438–432 B.C.E., pediment: c. 438–432 B.C.E., and metopes: c. 447–32 B.C.E.) follows as an illustration of an instance where the country that created works (Greece) have demanded their return and considers the arguments presented previously (Hazlitt, 2021).

The halfway mark of the north hall showcases the “Declaration on the Importance and Value of Universal Museums” of 2002, the response by 18 global museums across



**Figure 5.** Level 2: Hall of Ownership.

the world to the demand for repatriation of works in their collections. The arguments against repatriation are thus presented, including the argument that over time, the works in question have become part of the museum and nation that they are presented within and that often the peoples, nations, and political entities that created them no longer exist (Dearnley, 2021). Two examples follow that include an example that did and did not end in repatriation. The first, the case of the return of the *Bust of Nefertiti* (1341 BCE) to Egypt, Hitler refused in 1933 to return and stated instead that he would build an Egyptian museum to house the sculpture in (Batt, 2021). The second, the *Sarpedon Krater* purchased by the Metropolitan Museum of Art in New York was found to have been illegally looted from an Etruscan tomb in 1971 (Bundrick, 2021). The laws that forced the return of the Krater were then discussed at the end of the hall. The 1970 UNESCO Convention, for instance, allows for stolen or looted objects to be legally seized if there exists proof of ownership, and the 1995 UNIDROIT Convention on Stolen or Illegally Exported Cultural Objects, which demands the return of illegally excavated and/or exported cultural artifacts (Magri, 2021).

The player is then allowed to progress in Level 2 to the south hall. The hall is thematically dedicated to examples of theft directly from art museums or works *in situ* and is titled “The Hall of Looting: Smash and Grab.” Instead of works being looted or stolen in wartime, or complex histories of questionable excavations, all artworks in the south hall of the second floor were stolen by individuals in art heists. The first items the player comes across were taken in the greatest art heist in history from the Isabella Gardner Museum in Boston, Massachusetts on the night of March 18, 1990. The thieves stole 13 works valued at \$500 million, including *The Concert* by Vermeer (1664) (valued at \$250 million) and *The Storm on the Sea of Gallilee* by Rembrand (1633) (Vila, 2021). Next, the Munch heists are presented, starting with the daring daylight theft of *The Scream* (1893) (valued at \$110 million) on May 7, 1994, from the National Gallery in Oslo. The same work, along with the *Madonna*, was stolen again in 2004 (Runhovde, 2021). Finally, Caravaggio’s *Saint Jerome Writing* (1607) (valued at \$30 million), cut out of its frame in the St. John’s Co-cathedral at Valetta, is seen in the last niche (Pavia et al., 2021). With the deposit of the last works from “The Hall of Ownership” and “Hall of Looting,” as with the first level, a quiz is triggered that players must complete, demonstrating knowledge of the topics and laws covered in the level. The quiz questions are once again randomized.

### Level 3: The Hall of Stolen Fame

The final level is dedicated to one of the most famous artists in the Western canon, Leonardo da Vinci, and highlights the impact art heists have had on the fame of works of art. In “The Hall of Stolen Fame,” where the player automatically spawns at the base of the stairs on the lower level, west side, seven works of Leonardo is located. However, only one of the works in the group was actually stolen. Moving through a maze-like corridor of stacked crates that rise above the player’s head,

various works with information about Leonardo's career from apprenticeship to retirement are encountered, including *The Madonna of the Rocks* (1483–1486), *Lady with an Ermine* (ca. 1489–1491), *Madonna and Child with St. Anne* (ca. 1501), *Baptism of Christ* (ca. 1475), *Adoration of the Magi* (1481), *La Belle Ferronniere* (1490–1499), and, finally, the *Mona Lisa* (ca. 1503) (Figure 6). The final level is unique in two ways: (1) given the objective is to find only one stolen work, the enemies/guards and level is the most challenging to navigate and (2) the educational strategy relies on the player recognizing mainly one work as being the most famous from the *oeuvre* of the artist whereas the others are largely unknown to the general public. As with the first two levels, each niche containing a work has an audio clip and information about the work. Only the *Mona Lisa* is not housed in a niche and is at the end of the maze with accompanying historical photographs showcasing one of the most famous art heists in history. One of the most valuable paintings in the world, the work had an insurance valuation of \$100 million in 1962 (equivalent to \$870 million in 2021). The work was stolen by Vincenzo Peruggia in 1911 and



**Figure 6.** Level 3: Hall of Stolen Fame.

recovered in 1914. Ironically, Peruggia believed the work was looted by Napoleon during the Napoleonic Wars instead of being gifted by Leonardo to King Francis I (Oliveri et al., 2022). After depositing the final work in the repository, the player has a final quiz to complete. However, unlike the earlier quizzes, which are text based, the final quiz plays a random selection of videos and provides three scenarios for the player to act on. Central to the ethical dilemma facing all of those situations encountered, the player has the agency to do with the works that were collected as they wish. The narrative and user experience (UI) elements of the game leave open the nature of actions taken by the player as magnanimous, selfish, or pragmatic. The player can opt to (1) sell the works in the illegal sales market, (2) return the works to the nation or people that created them, or (3) return to the museum from which they were stolen. Each scenario triggers a video showcasing what could happen, including being arrested, the joyous return to a host country, and the general public enjoying a universal museum experience.

## Game Design and Production Process

The initial design and production of the educational game was divided into three phases—preproduction, production, and postproduction. The project ran from January to April 2022. After securing internal funding, a pitch deck was developed in early January, which served as the Game Design Document (GDD) for the project. The GDD served as a centralized vision for the project and helped communicate expectations to team members, provide context and background for the project, and outline necessary game mechanics and components for the project. During the preproduction process, planning for the project was completed and preliminary documents were constructed, including the GDD. In this phase, team members were selected, and the game's core play loop was defined.

The roles outlined in the grant proposal ensured faculty and student participation, along with outside contractors to fill any skills gap. The resident art historian served as a subject-matter expert (SME) and principal investigator (PI) for the grant. The SME created the GDD, preliminary level design, recorded audio clips, and provided text-based information to be included on pedestals and for quizzes. The resident game design faculty member acted as project manager and oversaw meetings, kept updated files in a shared cloud drive for the team, and provided trouble shooting for team members attempting new functionality in Unity. Two game design graduate students served as game and level designers for the project; an external coder was contracted for the UI/UX elements, such as the functionality of the main menu and quizzes; and, finally, a consultant who had developed educational historical games advised on process. The preproduction phase saw team members determine what tools and versions would be used for the project development. Unity game engine was decided due to team familiarity. During this phase, sprint meeting times were decided as well as communication platforms (Microsoft Teams and Discord), task delegation, and individual expectations.

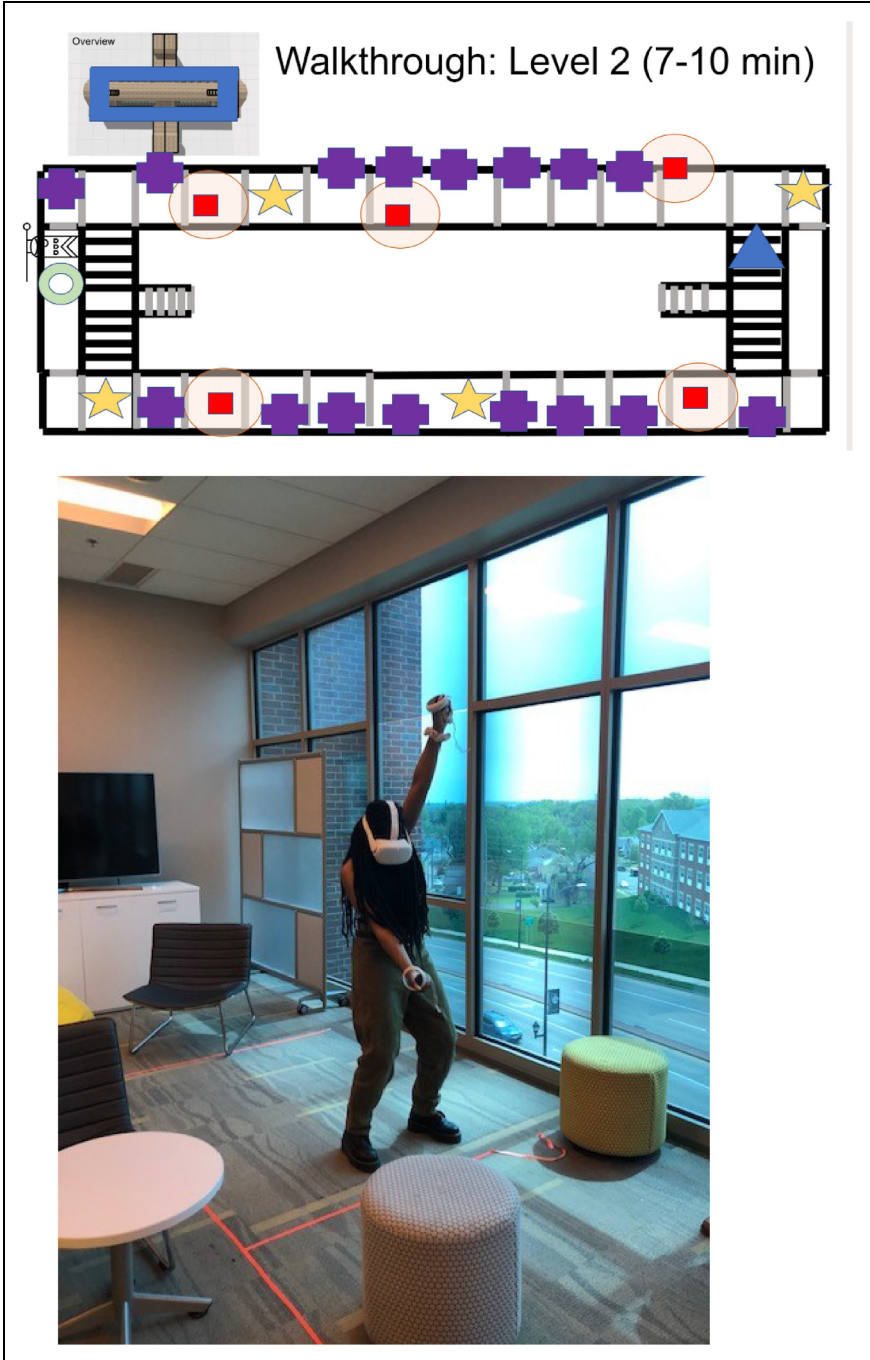
During the production phase, work in-engine began with team members being relegated tasks and game mechanics construction began. During this roughly 12-week phase, the team worked on modeling or finding game assets, designing game mechanics, developing UI components, and general troubleshooting. This phase also saw the widest delineation from the predetermined GDD sprint schedule. Regular spring meetings were conducted every week—every other week for 15 min and a full-hour report alternating weeks. During the meetings, each team member reported on their activities for the past week and had questions answered on the educational goals of the games, and identified technical solutions for player engagement. All meetings were conducted synchronously via video conference platform, and, in fact, the team never met physically being located in different regions around the United States. In general, the early stages of the project found that the development team was completing tasks much more quicker than initially outlined in the GDD. During the first two sprint meetings, all expected tasks were completed before the outlined dates in the GDD. Because of this, the development process saw a shift in workflow toward the end of the expected timeline. Basic locomotion and game mechanics were developed early on and provided more time later in the phase for UI creation and fixing game elements that were not working. By the end of the production phase, the team had developed working mechanics for all project Minimal Viable Product (MVP) goals.

Once all levels were completed and a beta version was ready for testing, the team oversaw recruitment and distribution of the build for the playtesting. In this final phase of postproduction, marketing content was developed in the form of copy and a trailer for the game, as well as final touches, were to be made in the game. A period of playtesting lasted 2 weeks in which participants would complete a survey after playing the game to facilitate critique and feedback. These surveys would be used to pinpoint bugs and problems in the game for fixing during this period. Game platforms such as Steam and Itch.io were also reviewed for future submission. This phase also saw the game project being accepted to a virtual conference dedicated to gamification in education.

## Methods

Part of the game development process included playtesting where the impact of ethical decision making was of interest to researchers of the study. Playtesters were solicited from the existing undergraduate and graduate programs in Game Design to provide feedback on the beta version of the game (Figure 7). The mixed-methods study included data from surveys collected from this population. The sample was collected from Lindenwood University, a private, 4-year, liberal arts institution in the suburban ring of St. Louis, Missouri. The purpose of the project was to assess respondents' gameplay experience, specifically the clarify of goals, whether additional instruction was needed to proceed in the game, whether they felt in control of outcomes in the game, whether controls were appropriate, and more. Results gathered were compared between demographics of major, age, and race/ethnicity. This project utilized a mixed-methods study design which included qualitative (open-ended comments) and





**Figure 7.** Playtesting *The Museum of the Lost* in the XR and Gaming Lab, LARC, Lindenwood University, St. Charles, Missouri.

thematic (quantitative) results from an online survey. The survey was administered in the spring of 2022 and collected data on student demographics in addition to the variables noted above. Participants were asked to indicate via a 1–10 Likert scale their experiences playtesting the game and recommended modifications to improve the experience. Students were contacted either through the university course management system or were emailed with links to online surveys. The survey was available for approximately 2 weeks at the end of the term and all data was collected using Qualtrics to ensure the privacy and anonymity of responses. These results were sorted based on the demographics (major, age, and race/ethnicity) and data were exported for the survey system. Descriptive statistics were calculated and used for comparisons between groups.

## Results

Of the respondents, 66.67% were undergraduate and 33.33% graduate students; 66.67% were 18–24 years of age and 33.33% were 25–34 years; 66.67% female and 33.33% male; all identified as White/Caucasian; 66.67% live off campus and 33.33% were residential students; half were online students and the other hybrid; none were student athletes, student employees, international students, military veterans, nor did they identify as having a disability or being a first-generation college student; and students were major in either game design or art history.

The feedback received from playtesting surveys noted elements to be addressed prior to the final release of the game. For instance, when asked about the clarity of goals in the game being present from the beginning all respondents selected “Somewhat disagree.” In order to improve an understanding of the goals of the game, students pointed to the need to clarify where the repository box was and the list of items to be collected. At the same time, half of the respondents stated that they would be able to replay the game without referencing the rules again. One student wrote: “I was unsure of what to do frequently. The instructions were unclear. I didn’t know if I had to get the objects in order, if I needed to restart after getting caught, or how to win. Also, huge motion sickness and the spotlight would go into the alcoves somewhat, so I’d get caught even when I thought I was in the clear.” In order to further improve an understanding of the rules, students stated additional text/speech instructions should be added to help clarify gameplay.

Despite the confusion over the rules of gameplay, all students agreed that they felt in control of the outcome of the game. All agreed that there was nothing they wanted the ability to do but could not in the game. But when asked if decisions made as part of gameplay were meaningful, all were neutral. Further free responses clarified this point by noting that the size of the work made it difficult to see where a player was going and the collisions kept catching on the wall. Additionally, the teleportation function could effectively bypass the obstacles designed to hide behind on each level to avoid detection from the guards. These considerations help explain why all respondents claimed the controls and player movement were inappropriate for gameplay during playtesting.

In considering the alignment of knowledge presented and the goals of the game, respondents were split evenly between being neutral and strongly agreeing. The same response rate was also the same when considering the amount of information being appropriate for the goals of the game. The free responses clarified that once audio was triggered, players felt compelled to stand there until it concluded, thus slowing gameplay and forcing them to replay the same track if returning to collect the work. As well, questions dealing with the immersive qualities of the game suggested that the lights should be dimmed and lights placed highlighting the specific works in alcoves. No one noted accessibility issues, however, and only one participant experienced VR sickness.

In response to the feedback, the development team addressed the points raised. First, collisions were reviewed and updated to ensure that the player could not teleport around obstacles. Furthermore, the objects themselves were modified to ensure they did not catch on walls when being carried to the repository. In order to address the concern of the goals of the game, the tutorial, which was an option in playtesting, was made mandatory to ensure the player had to go through training in how to move, pick up objects, and what the goals were when starting gameplay. Finally, the UI element of the audio was altered to ensure that it did not continue playing once the player walked away and would not be retrigged.

## **Recommendations**

To improve on the development and evaluation processes, the following recommendations and insights were gleaned from the team at the close of the project. For instance, the preproduction phase should be preceded by a finished GDD and Level Design Document. The pitch deck was created after the team was assembled, and a more efficient design process would be made possible with a fully fleshed-out project prior to the development cycle. For such a visually rich project, reference images and examples should be readily available from the outset for the whole team. To facilitate this process for a PI and/or SME, a template should be developed for internal use that can be filled out through a backwards learning design. Creating an expanded onboarding package for new SMEs would also be useful in what to consider, much like a design document in working for a client. The training should also include building expectations early on in the timeline so that the SME avoids continually adding additional functionality and UI elements as the project progresses.

In the preproduction phase, recruitment should be of paramount concern and preparations should be made to ensure the most qualified candidates can be identified efficiently and on the project timeline. At the outset of the project under discussion, a call for portfolios was sent out to the entire game design community on and off campus. However, even though the positions were paid, only two students submitted portfolios. One asked if the game produced for the grant could also apply to his thesis project. One option for departments with graduate game design programs would be to consider building such projects into thesis classes each term so that the student's final

deliverable would be a game for their portfolio. Alternatively, the team recommends relying on faculty recommendations for qualified candidates and reaching out to them individually and directly to solicit participation.

The production phase progressed quickly and smoothly. The recommendations for repeating such success follow the process outlined above. The timeline was appropriate for the group given the scale of the work. However, the scope of the project, number of levels, original assets to be created, etc. need to be considered to establish a realistic development timeline for other projects. The grant budgeted 30 h for the project manager, 20 h for each game designer, and 35 h for the coder. While the graduate students in the role of game designer found the time allotment to be ideal, they did note that would not be the case for a full-time student or those with other responsibilities. Also, the project manager and coder went over their allotted hours, thus the team recommends budgeting more by percentage for these roles. With regard to the milestones and check-in timeline, the group repeatedly noted how productive these were in terms of providing small goals to reach each week and getting regular feedback. Additionally, the regular meetings build rapport and camaraderie among the group, which led to more effective teamwork. The Discord provided the opportunity to ask small, technical questions and have them answered quickly on an as-needed basis to keep the project moving ahead. The project manager sent out weekly assignments, breaking down the expectations for each team member and providing a clear timeline and goals. The project manager also met with the team outside of weekly meetings to address any outstanding technical issues, such as advanced animations and character rigging.

The postproduction phase was truncated and could be expanded. Working under the constraints of the hours identified for the internal grant, the schedule for semester end dates, and the availability of playtesters, the team agreed that more time should be allotted for this phase. With the playtesting taking place over the course of 2 weeks, there was insufficient time to address all of the recommendations from respondents of the survey. Additionally, a broader range of student backgrounds would potentially yield new perspectives as the participants had either content knowledge of the game elements or understood the design and development process as either art history or game design majors. Finally, sharing files on Google Drive did prove to be sufficient for the scope of the project, but having multiple versions that up to five individuals were working on that needed to be merged and updated continuously was laborious. The project manager recommends moving to Git Hub or using other version control software.

## Conclusion

Emerging technologies continue to disrupt higher education models. But rather than viewing these trends as passing fads that will not weather the test of time the way the traditional lecture class has, administrators, IT professionals, instructional designers, and professors need to hold workshops and regular discussions on their viability in the changing educational landscape. The new participatory culture demands engaging

instructional material. Gone are the days of reading a textbook, listening to a lecture in class, and then taking an exam. In the information age, and as digital natives, students have near limitless access to information at their fingertips in real time and on demand. The role of educators will increasingly be to step aside and facilitate active learning strategies, stepping in, not as the sage on the stage, but as the SME who can assist with developing durable skills, information literacy, and higher-order thinking to apply knowledge in various contexts. The gamification of education, supported by XR technology, is one such tool at the disposal of educators today to assist in this way and ensure that immersive learning experiences are meaningful, impactful, and engaging.

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**Dr. Hutson** is an art historian specializing in early modern Italian art of the Renaissance and Baroque, immersive realities, digital humanities, and gamification of education. He received his BA in Art from the University of Tulsa, MA in Art



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**Ben Fulcher**, an assistant professor, Game Design has an MFA in Animation, Interactive Technology, and Video Design. Alongside teaching at Lindenwood University, Fulcher also serves as a volunteer educational game programmer and developer at EnTeam, a St. Louis area nonprofit focused on promoting cultural awareness through gaming. His research focuses on leveraging immersive technologies to promote cooperative gameplay among diverse populations.