# Bridging Virtual and Real: Gamification in Teaching Architectural Features with Assassin's Creed Odyssey

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**Abstract:** This study investigates the potential of gamification in architectural education by examining how immersive video games, such as Assassin's Creed Odyssey, influence the retention of architectural details and spatial understanding. The research aims to determine whether experiencing architectural spaces in a virtual environment enhances learning outcomes compared to traditional methods. The present study was conducted with a total of 20 participants from diverse professional backgrounds and undergraduate degrees, in order to ensure a heterogeneous sample and to more accurately assess the effectiveness of different instructional modalities in conveying architectural concepts to individuals without specialized training in the field. Participants were randomly assigned to one of two groups, each comprising 10 individuals. The experimental group interacted with the Assassin's Creed Discovery Mode, engaging with the game environment for a 30-minute-long predetermined period and exploring architectural features as presented within the game. In contrast, the control group was provided with a transcript of the in-game narration, allowing them to access the same informational content exclusively in textual form, without any interactive or visual elements. No preliminary information regarding the subject matter was given to either group prior to the intervention, thereby establishing an unbiased baseline. Following the intervention, both groups completed post-test assessments consisting of multiple-choice questions designed to evaluate their knowledge acquisition. Although the tests administered to each group were distinct, the questions were identical in content, ensuring comparability of results. The collected data were analyzed, and the findings were subsequently transformed into graphical representations to facilitate interpretation. The results were then evaluated to determine the relative efficacy of game-based versus text-based learning environments in fostering the recognition and understanding of architectural features. The findings of this research have important implications for both educators and game developers, underscoring the potential of video games and alternative instructional methods as effective tools in architectural education. This study contributes to the expanding literature on educational methodologies and offers valuable insights into the impact of immersive and text-based environments on the learning of complex subject matter.

**Keywords:** Gamification, Architectural education, Spatial cognition, Experiential learning, Assassin's Creed Odyssey

## 1. Introduction

The integration of gamification into educational practices has gained significant attention in recent years, particularly in fields requiring spatial cognition and experiential learning. Gamification, defined as the use of game design elements in non-game contexts, has been shown to enhance engagement, motivation, and learning outcomes across various disciplines (Deterding, 2011). In architectural education, where understanding spatial relationships and retaining visual details are critical, immersive video games offer a unique opportunity to bridge the gap between theoretical knowledge and experiential learning. Assassin's Creed Odyssey, with its Discovery Mode designed for educational purposes, provides a virtual environment where users can explore historically accurate reconstructions of ancient Greek architecture, making it an ideal tool for studying the impact of gamification on learning.

Experiential learning theory, as proposed by Kolb (1984), emphasizes the importance of learning through experience, particularly in disciplines that require the development of practical and spatial skills. Virtual environments, such as those provided by video games, align closely with this theory by offering learners the opportunity to interact with and explore architectural spaces in a way that traditional methods, such as reading or watching videos, cannot replicate. Research has demonstrated that immersive environments can improve spatial memory and understanding, as well as increase engagement and interest in the subject matter (Gee 2003; Poggiolesi 2016). However, the effectiveness of such methods compared to traditional approaches remains underexplored, particularly in the context of architectural education.

This study investigated the potential of gamification in teaching architectural features by comparing the learning outcomes of participants who engaged with the Discovery Mode of Assassin's Creed Odyssey to those who learned through traditional methods, such as reading educational texts. Additionally, the study examined how participants' diverse professional backgrounds and undergraduate degrees influenced the effectiveness of these learning methods. By employing a mixed-methods approach, the research provided a nuanced understanding

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of how immersive environments impacted the retention of architectural details, spatial cognition, and engagement. The findings contributed to the growing body of literature on game-based learning and offered insights into the role of gamification in architectural education.

## 2. Methodology

This study employs a mixed-methods approach to investigate the effectiveness of game-based learning compared to traditional learning methods in teaching architectural features, focusing exclusively on participants without prior design knowledge. The participants (n=20) are divided into two groups: an experimental group (n=10) and a control group (n=10). No prior information or materials are provided to participants before the intervention to ensure an unbiased baseline for both groups.

Participants in the experimental group engage with the Discovery Mode of Assassin's Creed Odyssey for approximately 30 minutes, during which they are guided to explore three features of discovery moods which are, 1: "The Akropolis of Athens"; 2: "The Agora of Athens" parts under "Famous Cities" and 3: "The Urban Household" under "Daily Life" part.

Participants in the control group (n=10) learn through traditional methods by reading a transcripted text from the game about three features of discovery moods mentioned above. The text is designed to cover the same architectural content as the game, ensuring comparable exposure to the material across both groups.

After the intervention, a post-test survey was conducted to measure participants' knowledge of architectural features and spatial understanding. The survey consisted of multiple-choice questions divided into two sections. The first section comprised 9 questions focused on theoretical knowledge, assessing participants' understanding of key architectural concepts. The second section included 20 questions designed to evaluate spatial understanding and the ability to comprehend architectural spaces. These questions aimed to evaluate participants' ability to recall and recognize key architectural concepts presented during the learning process, providing a clear and objective measure of their understanding. Quantitative data from the post-test are analyzed to test knowledge gains between the two learning methods.

This methodology allows for a focused comparison of game-based and traditional learning methods in teaching architectural features to individuals without specialized training in the field. By integrating quantitative data, the study provides valuable insights into how immersive environments and traditional approaches impact the retention of architectural details, spatial understanding, and engagement.

## 3. Study Design and Implementation

### 3.1 Participants

The study involved a total of 20 participants aged between 18 and 35, all of whom were selected from diverse professional backgrounds and undergraduate degrees to ensure a heterogeneous sample for evaluating the effectiveness of the learning methods. This approach was adopted to eliminate potential biases stemming from pre-existing familiarity with architectural concepts. Participants were divided into two groups: an experimental group (n=10) and a control group (n=10). Gender distribution was balanced to avoid gender-related biases in learning preferences or outcomes. All participants were graduate students from non-design-related disciplines, ensuring that their exposure to architectural concepts was limited to the interventions provided during the study.

### 3.2 Test Design

The test design was structured to compare the learning outcomes of game-based and traditional text-based methods in teaching architectural features. The experimental group played the Discovery Mode of Assassin's Creed Odyssey. They group explored three distinct features designed to provide an immersive understanding of Ancient Greek architecture and daily life.

A common critique of game-based learning studies is the suggestion that similar educational outcomes could be achieved simply by presenting the same content through video, without the need for interactive gameplay. However, this perspective overlooks the fundamental differences between passive observation and active engagement. In the context of this study, the Discovery Mode of Assassin's Creed offers a level of interactivity that cannot be replicated by video alone. Participants are not merely passive recipients of information; instead, they actively navigate the virtual environment, make decisions about where to go, and engage directly with architectural spaces.

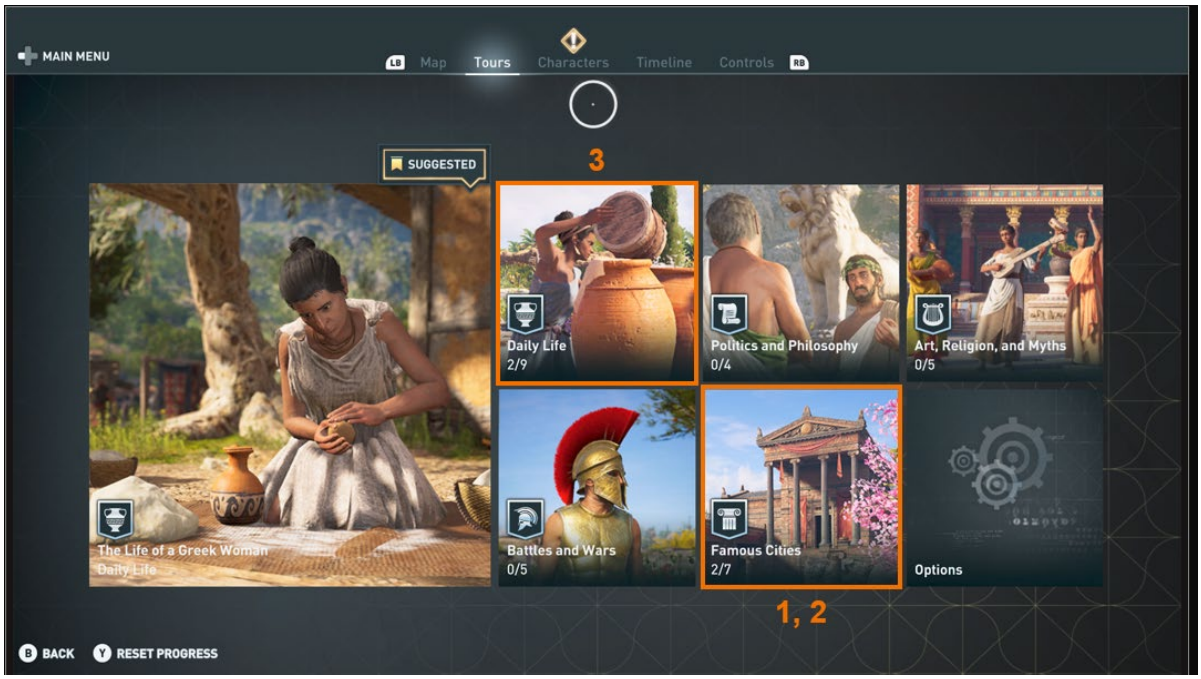


**Figure 1: Main screen, displaying all the features that can be discovered within the discovery mode**

The first feature, "The Akropolis of Athens," which can be found under the Famous Cities, focused on the Parthenon, a monumental symbol of Ancient Greek civilization. Participants examined its intricately carved exterior, depicting mythological scenes such as the birth of Athena and the Panathenaic procession, as well as its interior, which housed a statue of Athena, emphasizing the artistic and cultural significance of Athens.

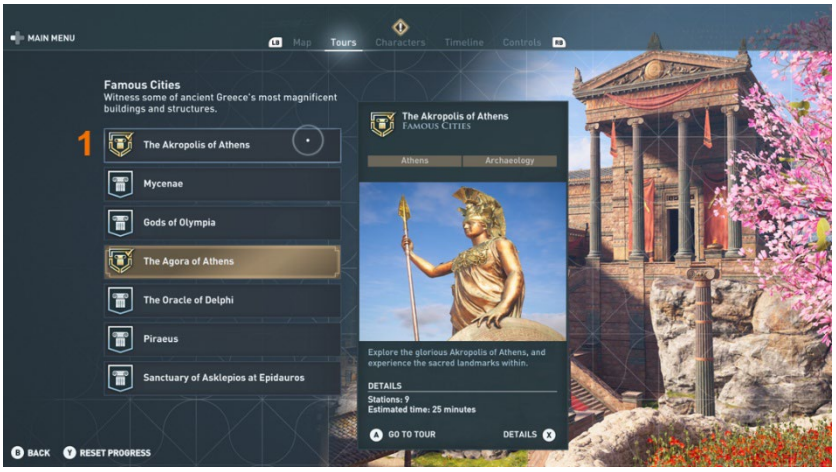


**Figure 2: "The Akropolis of Athens" section under the main title "Famous Cities"**

In the virtual environment of the Acropolis, participants are initially presented with a wide-angle overview that highlights the areas to be explored. Specific locations within the Acropolis are marked with a yellow tube, indicating the points where participants are required to pause. At these highlighted spots, users stop and engage in an exploration of space, allowing for a focused examination of architectural and historical features.


**Figure 2: Wide angle view of the Akropolis of Athens**


**Figure 3: One of the spot that needs to be stopped**

After pausing at these designated points, participants continue their journey through the environment, interacting with the surroundings and various features. For example, they can enter the Parthenon, where they are able to perceive the scale of the structure and directly experience its architectural elements. This process of moving through the space, stopping at key locations, and interacting with the environment provides a dynamic and immersive learning experience that enables participants to develop a deeper understanding of both the spatial organization and the distinctive features of the Acropolis.

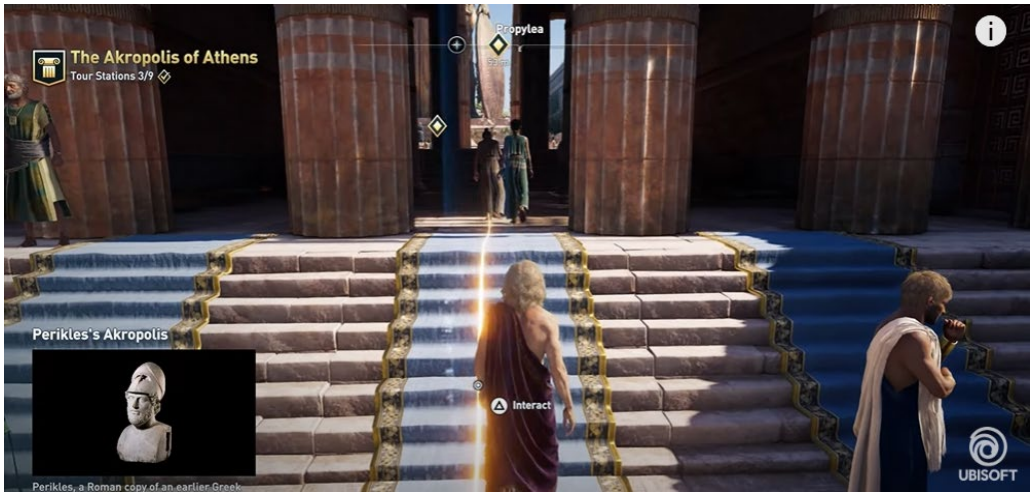

**Figure 4: Entrance to the Akropolis of Athens**

The second feature, "The Agora of Athens," under Famous Cities, introduced participants to the civic and social hub of the city, where citizens, merchants, and philosophers gathered. Key elements included the Painted Stoa, renowned for its military-themed artwork and philosophical importance, the Hephaisteion temple dedicated to Hephaistos and Athena, and the Bouleuterion, the meeting place of the Athenian council, showcasing the democratic and cultural life of the city.

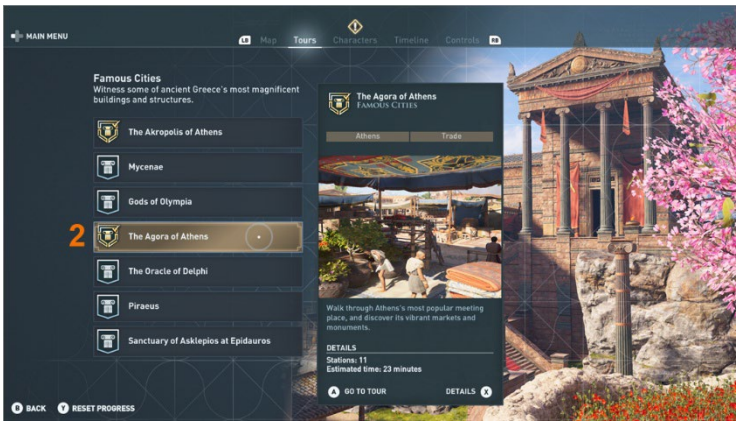


**Figure 5: "The Agora of Athens" sections under the main title "Famous Cities"**

For example, when exploring the Painted Stoa, participants can approach the murals, observe details from different angles, and interact with the environment in ways that foster a deeper spatial and experiential understanding. This kind of embodied interaction allows users to construct knowledge through direct experience, aligning with experiential learning theories that emphasize the importance of active participation in the learning process.

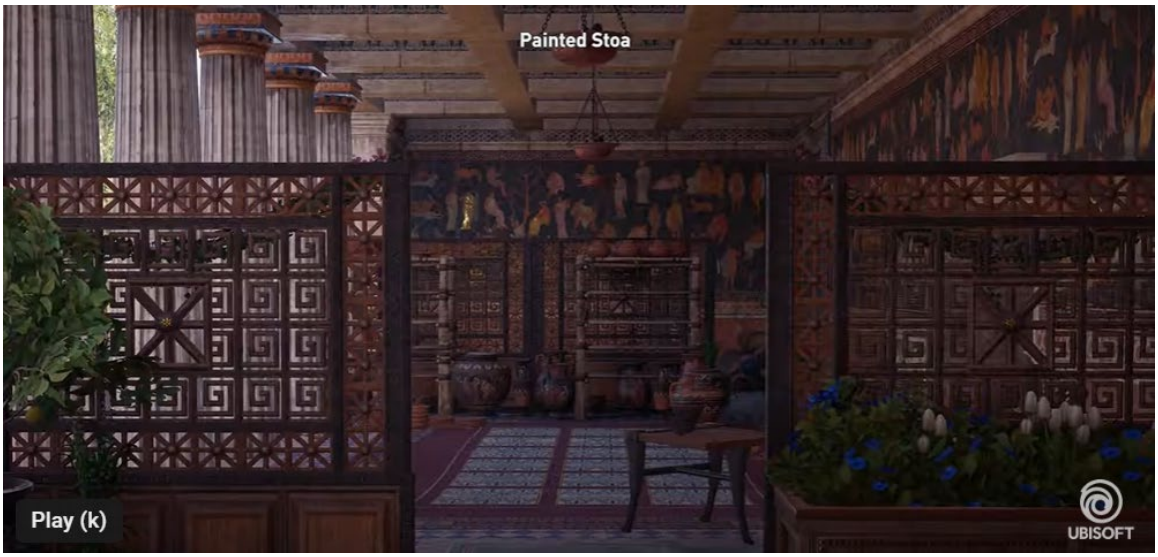


**Figure 6: Painted Stoa under the Agora of Athens**

Within the Agora of Athens, participants are able to move freely through the marketplace, as shown in the image. They can navigate among the stalls, observe the activities of various vendors, and experience the spatial organization and social dynamics of the agora in real time. This real-time exploration allows learners to choose their own paths, pause to examine specific details, and immerse themselves in the everyday life of the ancient city. The presence of animated vendors and market-goers, as depicted visually, provides a dynamic and authentic atmosphere that cannot be conveyed through static video footage. The learner's ability to control their movement and perspective within the space fosters a sense of presence and engagement that is fundamentally different from watching a pre-recorded sequence.

Additionally, the experience within the Bouleuterion, as illustrated in the second image, further demonstrates the depth of interaction possible in the game environment. Participants can enter the Bouleuterion and attend

events that are taking place inside. They have the opportunity to engage in conversations with non-player characters, listen to the discussions and debates occurring among the citizens, and observe the rituals and procedures of civic life. This interactive participation allows learners to not only witness but also take part in the social and political processes of ancient Athens. The ability to listen to conversations and interact with historical figures provides a level of immersion and contextual understanding that is unattainable through video alone. The images reinforce these points by visually representing the learner's perspective within these spaces. In the agora, the participant's viewpoint is situated among the market stalls, surrounded by vendors and goods, highlighting the immediacy and authenticity of the experience. In the Bouleuterion, the participant is positioned within the assembly, able to observe and listen to the proceedings, further emphasizing the participatory nature of the environment.


**Figure 7: Market under the Agora of Athens**


**Figure 8: Bouleuterion and judicial court under the Agora of Athens**

The third feature, "The Urban Household," provided insights into the design and function of Greek homes, or oikos, which revolved around a central courtyard. Participants explored spaces such as the andron (men's quarters for symposia), the gynaikonitis (women's quarters), and functional areas like the kitchen and bathroom, reflecting the social structure, gender roles, and practical aspects of domestic life in Ancient Greece.

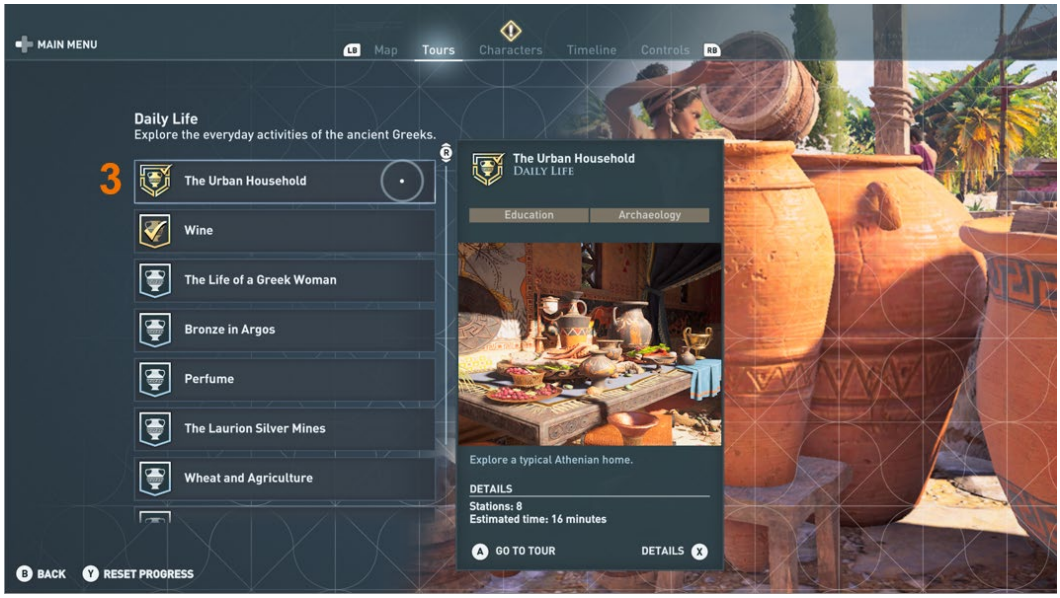


**Figure 9: "The Urban Household" section under the main title "Daily Life"**

Within the inner courtyard, participants can freely navigate the space, experiencing its layout and atmosphere firsthand. The environment is not static; learners can approach and interact with specific features, such as the sacred pool dedicated to Zeus located at the center of the courtyard. This interaction is not merely visual—participants can pause, examine the pool's details, and receive contextual information about its religious significance, deepening their understanding of ancient Greek spiritual practices.


**Figure 10: Inner courtyard under the urban household section**

In the kitchen area, the experience extends beyond architectural observation to include cultural immersion. Participants can witness the preparation of food, observing the tools, ingredients, and methods used in ancient Greek cuisine. This direct exposure allows learners to gain insights into the Greek diet, culinary traditions, and daily life, which would be difficult to convey through video alone. The ability to move around the kitchen, observe the cooking process from different angles, and receive explanations about the food being prepared creates a multisensory learning experience.


**Figure 11: Kitchen under the urban household section**

The women's quarters, or gynaikonitis, offer another layer of interactive learning. Here, participants can observe women gathered together, engaged in conversation. The environment allows learners to not only witness these social interactions but also to join the group, listen to their discussions, and even participate in the conversation. This level of engagement provides a unique perspective on gender roles, social customs, and the private lives of women in ancient Greek society. The opportunity to interact with non-player characters in this context fosters empathy and a deeper, more nuanced understanding of historical social dynamics.

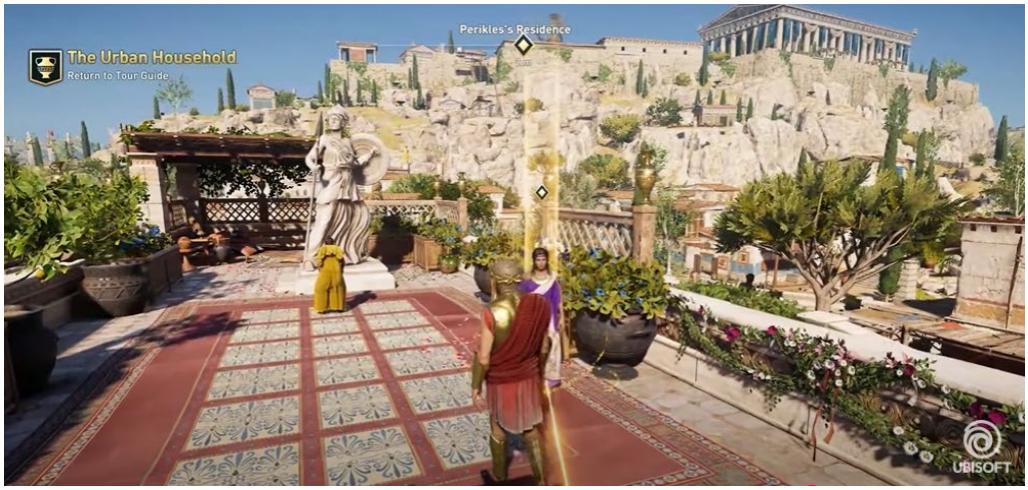


**Figure 12: Upper terrace, gynaikonitis under the urban household section**

The control group, in contrast, engaged with the same content presented in the game, but in the form of a transcribed text. This text was organized according to the sequence of gameplay and provided an exact, verbatim transcript of the information delivered by the in-game guide, ensuring that the control group received identical content to that experienced by the experimental group, but presented in a non-interactive, text-based format.

**TEXT BASED INFO**

## 1. Parthenon

**Parthenon Exterior**

The Parthenon is one of the most well-known buildings in the world and an enduring symbol of Ancient Greek civilization. While located on the Akropolis, the building is not a traditional temple. It was built by the sculptor Phidias and the architects Kallikrates and Iktinos as a great monument to the glory of the city of Athens. This glory is evident in its many carvings.

As one of the most intricately carved monuments in Greek architecture, the Parthenon's decorations depict several mythological scenes. These include the birth of Athena, her fight against Poseidon for the patronage of Athens, the gods' battle with the giants, and the procession of the Great Panathenaia.

**Parthenon Interior**

The Parthenon's inner chamber, or cella, contained a massive statue of Athena, considered one of the sculptor Phidias's greatest masterpieces. The statue was chryselephantine, a combination of gold and ivory. To justify the steep cost of its construction, Perikles told Athenians that the statue was a gold reserve that could be disassembled in times of economic distress.

The cella also allegedly contained a pool whose main purpose was to control the room's humidity, preserving the statue's ivory. Unfortunately, the statue was either destroyed by a fire or brought to Constantinople in late Roman times, where all trace of it was lost. However, descriptions from historians like Plutarch and Pausanias, as well as smaller copies like the marble Varvakeion statuette, allow for detailed reconstructions.

The goddess Athena was depicted armed with a triple-crested helmet featuring a sphinx and two griffins, a large circular shield in her left hand, and a spear. She held a winged Nike two meters tall in her right hand, while a huge sacred snake coiled between her left foot and the shield. She wore a typical peplos robe tucked into a belt, and on her chest was a snake-ridged aegis displaying the head of Medusa. Today, a modern replica of the statue stands in a copy of the Parthenon in Nashville, Tennessee.

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## 2. Agora

**Overview**

The agora was the civic center of Athens, frequented not only by politicians and city officials but also by merchants, philosophers, and citizens. It housed a market where people could purchase food and goods, and it served as a space for philosophers to establish schools and teach students. Temples dedicated to Hephaistos and Apollo were also located in the agora, along with the Altar of the Twelve Gods.

**Painted Stoa**

The Painted Stoa, or *Stoa Poikilè*, derived its name from the panel paintings on its walls. These paintings, created in the 5th century BCE by artists like Polygnotos, depicted Greek military victories such as the Battle of Marathon. The Stoa served as a public meeting place and was especially popular with philosophers, including Zeno of Kition, who founded the Stoic school of philosophy there.

**The Hephaisteion**

The Temple of Hephaistos, located on the Kolonos Agoraios hill, is one of the best-preserved temples in Greece

**Figure 13: Text based info that applied to control group**

### 3.3 Survey Design

The survey questions were structured in two distinct parts to comprehensively assess participants' knowledge and understanding of the architectural, cultural, and spatial aspects of Ancient Greek spaces explored during the intervention. Part 1 consisted of theoretical questions, while Part 2 focused on spatial comprehension. The survey, administered via Google Forms , included only multiple-choice questions and covered three main areas: the Akropolis of Athens, the Agora of Athens, and the Urban Household. To ensure consistency, the same survey was used for both groups, with separate links for the text-based and game-based learners to facilitate data collection specific to each learning method.

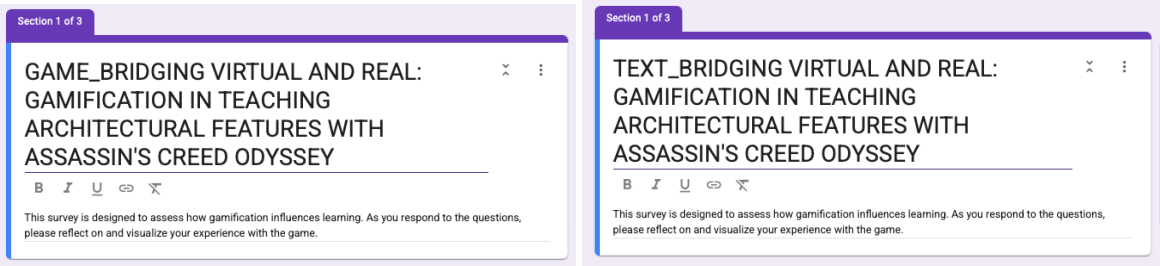


**Figure 14: Game and Text based survey titles applied two different groups**

In section 1, the theoretical section, questions assessed participants' recall of factual and conceptual information. For example, participants were asked about the architectural features and mythological carvings of the Parthenon, the materials and purpose of the statue of Athena, and the symbolic significance of various structures. Additional questions in this section addressed the civic, commercial, and social functions of the Agora, as well as the roles of specific buildings such as the Painted Stoa, Bouleuterion, and Heliaia. For the Urban Household, theoretical questions covered the design and layout of Greek homes, including the functions of the andron (men's quarters), gynaikonitis (women's quarters), and the significance of household spaces like the kitchen and bathroom. Cultural practices, such as the symposium and aspects of the Greek diet, were also included.

Section 2 focused on spatial comprehension and the participants' ability to understand and interpret the organization and use of space within these ancient environments. Questions in this section required participants to identify the locations of specific features within the Akropolis, Agora, and Urban Household, interpret spatial relationships, and recognize the functions of different areas based on their layout. For example, participants were asked to determine where certain activities took place, how spaces were accessed or connected, and to visualize the arrangement of architectural elements within the sites.

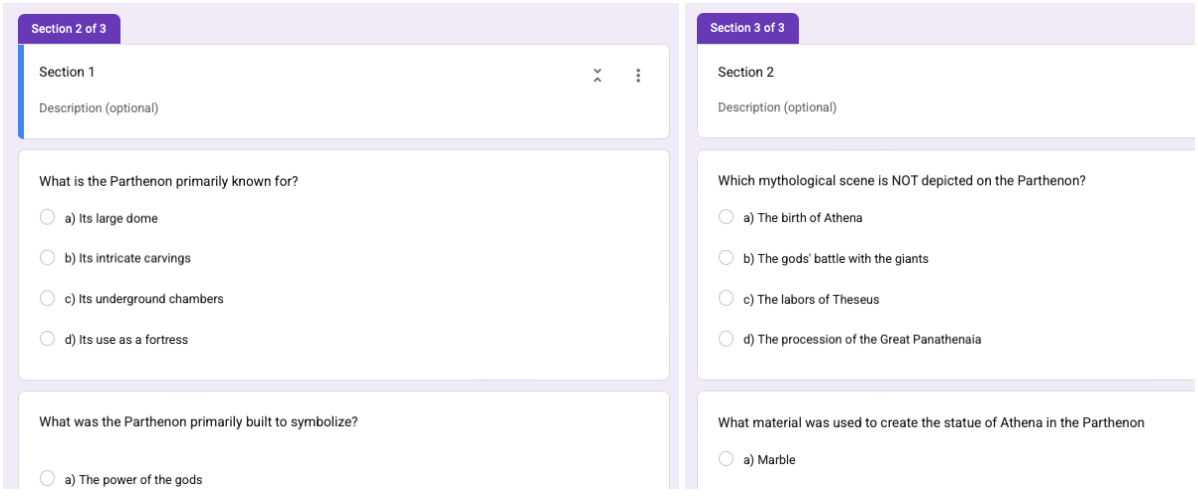


**Figure 15: Insights from game and text based survey**

By dividing the survey into theoretical and spatial parts, the study ensured a balanced evaluation of both factual knowledge and spatial understanding.

## 4. Results and analysis: Comparing Game-Based and Text-Based Learning

The results of the post-test survey, as visualized in the graphics, compare the performance of the game-based and text-based groups across two sections: Part 1 (theoretical questions) and Part 2 (visual and spatial comprehension questions).

In the game-based group, responses were notably more balanced, with most participants providing correct answers across both sections. In the visual and spatial questions (Part 2), the group achieved high overall success, with accuracy rates consistently in the 80–100% range. This indicates a strong and homogeneous understanding of spatial relationships and visual features, likely supported by the interactive and immersive nature of the game environment. In the theoretical section (Part 1), the game-based group also performed better than expected, with correct response rates generally between 60% and 90%. This suggests that the contextual and visual cues provided by the game not only supported spatial learning but also facilitated the retention of theoretical knowledge.

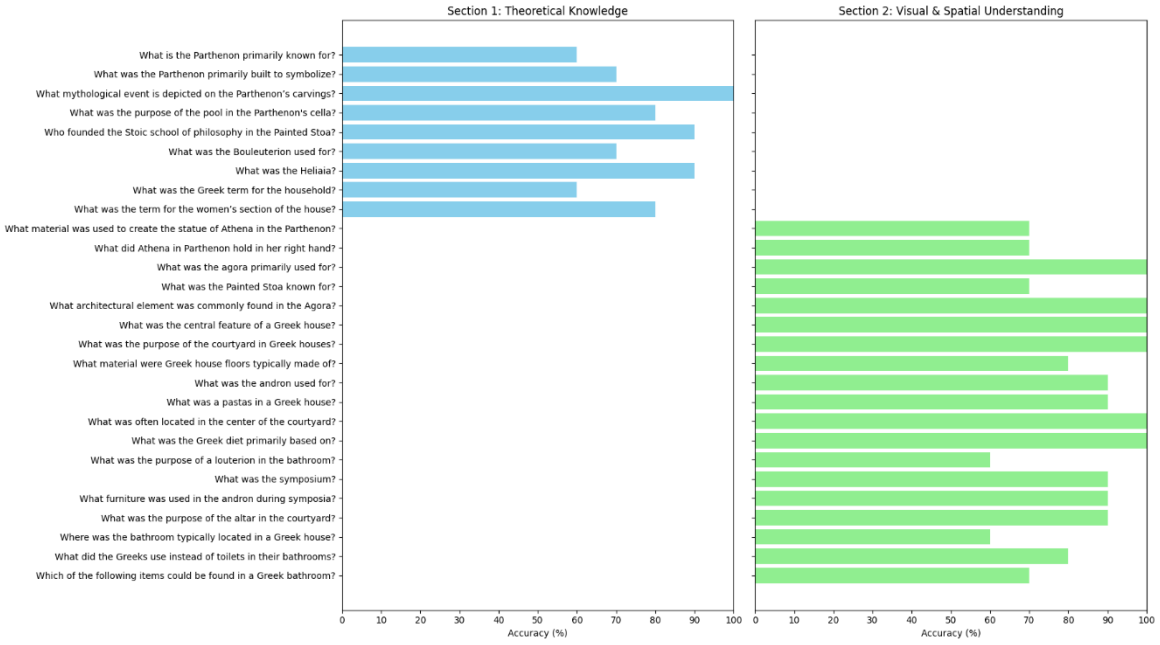


**Figure 16: Gamebased, Section 1 and 2 Results - Theoretical Knowledge/Visual & Spatial Understanding**

The text-based group's responses varied significantly, likely reflecting differences in individual focus and attention during reading. In the theoretical questions (Part 1), this group achieved higher success rates, with most scores falling in the 70–90% range. However, in the visual and spatial questions (Part 2), their performance was much more variable, with accuracy rates ranging widely from 40% to 100%. This variability suggests that, while some participants were able to use imagination or prior knowledge to answer spatial questions correctly, others struggled without the benefit of interactive or visual exploration.

An unexpected finding was that game-based participants performed well in theoretical questions, indicating that the game's context and visual cues may have reinforced theoretical learning. Conversely, some text-based participants achieved high scores in spatial questions, possibly by effectively visualizing and imagining the spatial concepts described in the text.

It is also likely that the interactive and enjoyable nature of the game-based learning environment contributed to higher engagement among participants, which may have supported more consistent and effective learning outcomes, particularly in the spatial section.

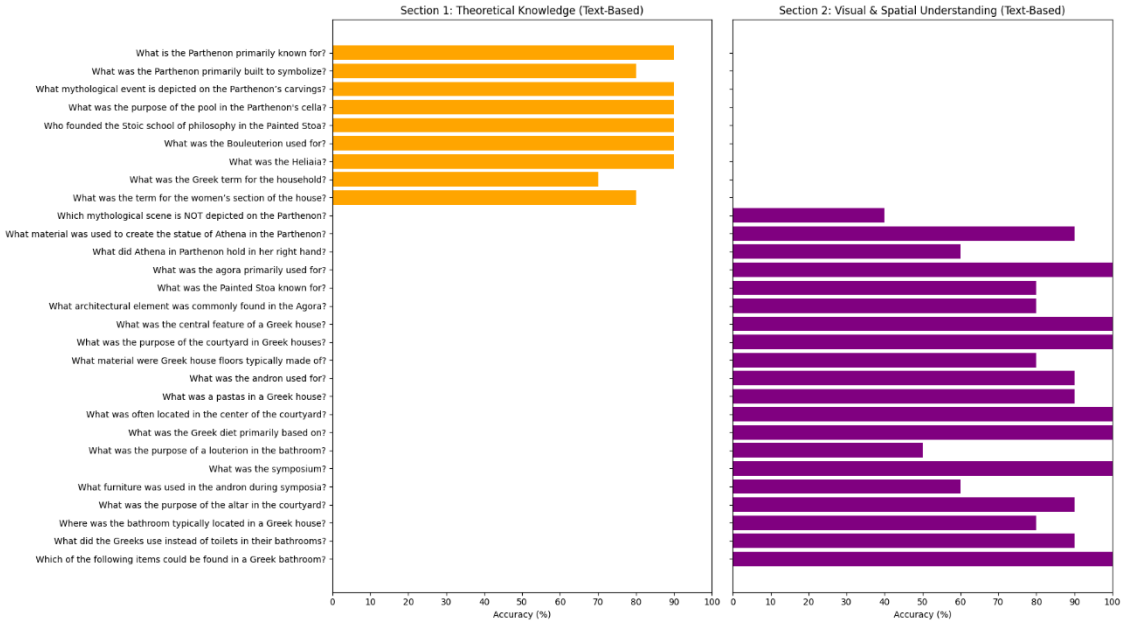


**Figure 17: Text based, Part 1 and 2 Results - Theoretical Knowledge/Visual & Spatial Understanding**

## 5. Discussion and Conclusion

The findings of this study provide important insights into the comparative effectiveness of game-based and text-based instructional methods in architectural education. The results demonstrate that while both approaches can facilitate the acquisition of theoretical knowledge, the game-based method offers distinct advantages in fostering spatial understanding and ensuring a more homogeneous distribution of learning outcomes among participants.

One of the most significant observations is the consistency and high performance of the game-based group in the visual and spatial comprehension section. The interactive and immersive nature of Assassin's Creed Odyssey's Discovery Mode enabled participants to actively engage with architectural environments, navigate spaces, and interact with features in real time. This hands-on experience appears to have supported the development of robust spatial cognition, as evidenced by the group's accuracy rates consistently falling within the 80–100% range and the notably balanced distribution of correct responses. The opportunity to pause, explore, and directly experience architectural elements likely contributed to a deeper and more uniform understanding of spatial relationships and visual details.

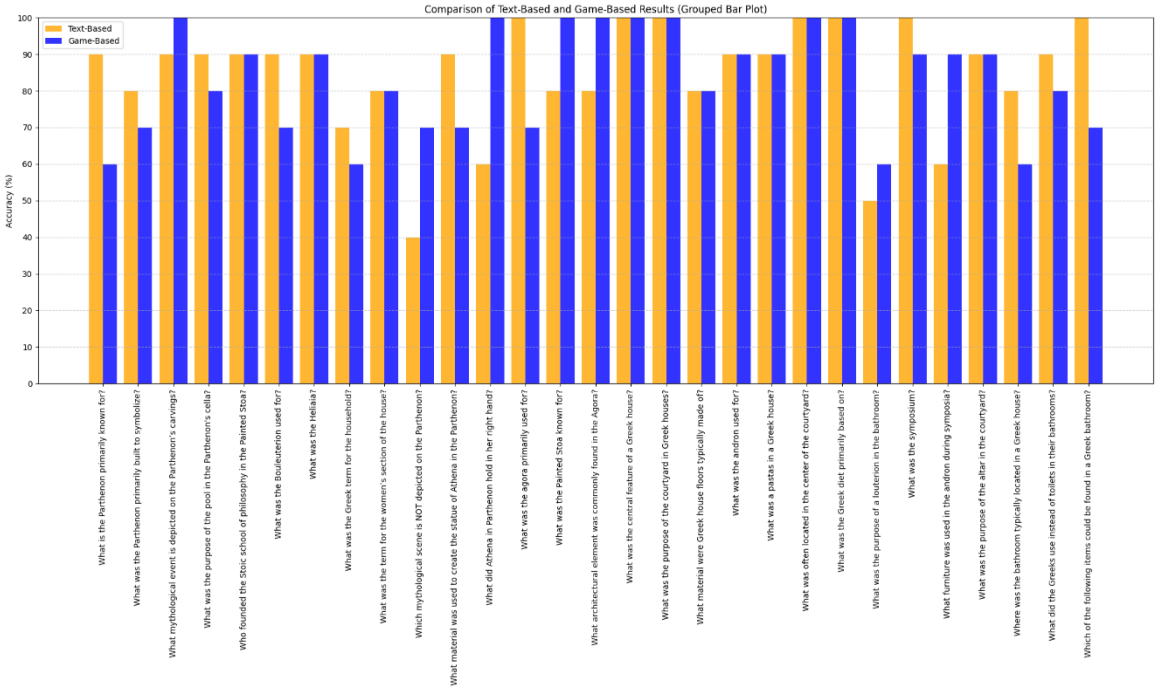


**Figure 18: Bar chart comparing the responses of text-based and game-based groups**

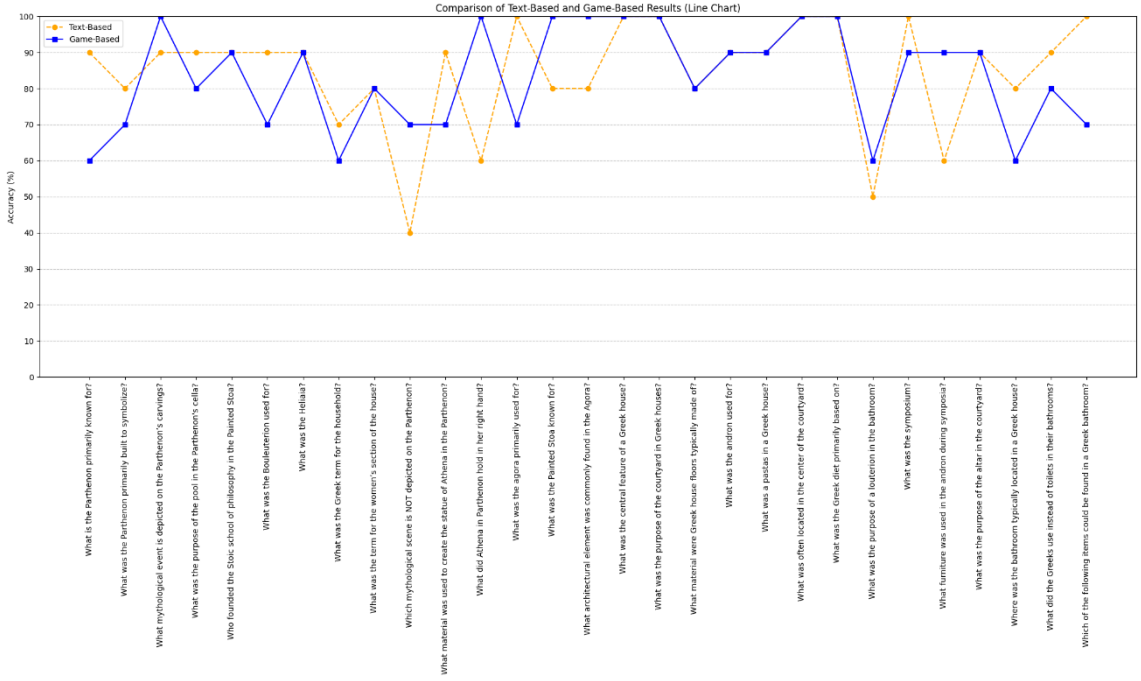


**Figure 19: Line chart comparing the responses of text-based and game-based groups**

The images further illustrate these experiences by placing the learner within the spaces themselves—standing beside the sacred pool, observing the kitchen activities, or sitting among the women in the gynaikonitis. Each of these scenarios demonstrates the game's capacity to offer agency, choice, and immersion, enabling participants to construct knowledge through direct, embodied experience. Through these interactive encounters—navigating the inner courtyard, engaging with sacred and domestic spaces, and participating in social life—the game facilitates a form of learning that is active, contextual, and deeply immersive. This approach aligns with experiential learning theory and underscores the unique educational value of game-based environments in teaching complex architectural, cultural, and social concepts. Unlike video-based or text-based instruction, which confines the learner to a predetermined viewpoint and sequence, the interactive environment empowers users to explore, inquire, and engage with the content in a manner that is both personal and meaningful. The

ability to interact, such as entering a space and conversing with characters, helps participants remember activities more vividly, as the act of participation reinforces memory retention.

In contrast, the text-based group, while achieving relatively high scores in theoretical questions (70–90% range), exhibited greater variability in the spatial section, with accuracy rates ranging from 40% to 100%. This suggests that passive engagement with transcribed content, even when it is comprehensive and well-structured, may not be sufficient to support all learners equally in developing spatial understanding. The variability in performance may be attributed to differences in individual imagination, prior knowledge, or attention during reading, highlighting the limitations of traditional text-based instruction for spatially complex subject matter. Watching a video or reading a text is a passive activity where the learner has no control over the pace, perspective, or sequence of exploration. The lack of agency and interaction limits the depth of engagement and the potential for meaningful learning. An unexpected but noteworthy finding is the strong performance of the game-based group in theoretical questions (60–90% range). This suggests that the contextual and visual cues embedded in the game environment not only enhance spatial learning but also reinforce the retention of factual and conceptual information. Conversely, the occasional high performance of text-based participants in spatial questions indicates that some individuals are capable of constructing mental models from text alone, though this is less consistent across the group.

The study also underscores the role of engagement in learning outcomes. The interactive, enjoyable, and exploratory qualities of the game-based environment likely contributed to sustained attention and motivation, which are critical factors in effective learning. This is particularly relevant in architectural education, where the ability to visualize and mentally manipulate spaces is essential.

In conclusion, the research highlights the potential of gamification and immersive virtual environments as powerful tools in architectural education. Game-based learning not only supports the acquisition of theoretical knowledge but, more importantly, provides a significant advantage in developing spatial understanding—a core competency in the field. While text-based methods remain valuable for conveying factual information, their limitations in supporting spatial cognition suggest that they are best used in conjunction with more interactive approaches. These findings have important implications for educators and curriculum designers, advocating for the integration of game-based and experiential learning strategies to enhance educational outcomes in architecture and related disciplines.

Future research could further explore the long-term retention of knowledge gained through game-based learning, the impact of different types of interactivity, and the applicability of these findings to other domains requiring spatial skills. Overall, this study contributes to the growing body of literature on gamification in education and demonstrates the unique value of virtual environments in bridging the gap between theoretical knowledge and real-world experience.

**Ethics Declaration:** This study did not require ethical clearance as it did not involve sensitive personal data, vulnerable populations, or interventions that could pose risks to participants. All participants voluntarily consented to take part in the research, and their responses were anonymized to ensure privacy and confidentiality.

**AI Declaration:** AI tools were utilized in the creation of this paper to assist with specific tasks, including language refinement, data visualization, and the generation of explanatory content for charts and results. However, all research design, data collection, analysis, and interpretation were conducted by the authors. The AI tools were used solely to enhance the clarity and presentation of the findings, and the intellectual contributions remain the sole responsibility of the authors.

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