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How Do Information Games Apply Environmental Storytelling in Implicit Tutorials to Enable Players' Knowledge Acquisition and Freedom to Explore?

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ABSTRACT: This thesis explores the way environmental storytelling is applied to implicit tutorials in information games, which allows players to acquire knowledge and freely explore through experiential learning. By analyzing case studies of *Chant of Sennaar* (Rundisc, 2023), *Outer Wilds* (Mobius Digital, 2019) *and Myst: Masterpiece Edition* (Cyan Worlds Inc, 1999), based on cognitive psychology frameworks and theories, the possibility of using environmental storytelling to guide players' perception, memory, attention and motivation is investigated. Findings suggest that balancing instructional clarity and autonomy is essential for successful tutorial design. The research provides insight for designers to improve both learning effectiveness and narrative enjoyment. Limitations include the focus on explorer-type players and the use of secondary qualitative analysis. Future research could employ empirical testing and explore applicability across broader game genres.

KEYWORDS: information games, environmental storytelling, implicit tutorials, knowledge acquisition, freedom to explore

INTRODUCTION

Information games are a relatively new and evolving genre within the gaming industry, defined as 'games in which players have to understand the story to proceed' (Francis, 2024, 1:49). As suggested by Martin (2020), it came into the view of mainstream around 2015, starting with exemplars such as Her Story (Barlow, 2015) or Return of the Obra Dinn (Pope, 2017). These games are characterized by relying on players interpreting contextual information rather than following instructions. Consequently, they often adopt implicit tutorial methods, in which players learn through exploration and experimentation embedded within the game world.

Tutorials play a crucial role in shaping players' initial experience and ensuring essential mechanics and objectives are clearly conveyed. However, traditional explicit tutorial designs can fail to provide learning experiences that are both effective and entertaining for players, which can disrupt engagement and result in weak knowledge retention, such as the pop-up windows that forcefully pause the game and do not provide any immediate opportunities for players to try out what they have just learned (White, 2014), which can be found in games like Monster Hunter: World (Capcom, 2018). To address these issues, implicit tutorials have been introduced to the recent gaming industry. According to Green et al. (2021), this type of tutorial teaches players through a carefully designed experience, giving them chances to experiment freely, and direct instructions are seldom used, enabling players to interact with the game context and learn through practice.

In such cases, a powerful tool integrated into implicit tutorial design sessions has been environmental storytelling, which refers to 'staging player-space with environmental properties that can be interpreted as a meaningful whole, furthering the narrative of the game' (Smith and Worch, 2010, p.16). Using such narrative techniques enables players to interact with in-game objects and learn through practical experiences, resulting in better knowledge retention.

Despite its advantages, implicit tutorial design must carefully balance guidance and autonomy to prevent player frustration. Therefore, this thesis will explore how designers utilize environmental storytelling in implicit tutorials to aid players' knowledge acquisition, which could encourage their free exploration in the game context in later stages.

In this thesis, the concepts of implicit tutorials and environmental storytelling will be defined in the literature review, which will be supported by knowledge from the field of cognitive psychology to establish links between environmental storytelling in tutorial design and the human learning process. The discussion will focus on implicit tutorials due to their capacity to enhance practical understanding and immersive engagement through experiential learning, making them more compatible with narrative integration than explicit instruction, which often limits design flexibility. Case studies, including Chants of Sennaar (Rundisc, 2023) and Outer Wilds (Mobius Digital, 2019), will demonstrate how implicit tutorials successfully combine narrative elements with gameplay instruction, while contrasting examples such as Myst: Masterpiece Edition (Cyan Worlds Inc, 1999) will be used to highlight common limitations.

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LITERATURE REVIEW

1. Tutorial

Definition

A tutorial is defined as "any component of a digital game that is intended to teach someone how to play" (White, 2014, p.18). Its importance lies in enabling players to acquire the necessary skills and comprehend the game mechanics. White distinguishes between explicit and implicit tutorials, where explicit tutorials are "direct, informational, and traditional (ibid., p.35)" such as instruction books, pop-up windows and flashcards, while implicit tutorials 'require the learner to go looking, allowing players to make mistakes and learn from them' (ibid.), such as character dialogue, environmental storytelling, and plot-driven tasks.

Goals of a tutorial

Traditional explicit tutorials often succeed at straightforwardly delivering information, but they tend to treat learning as a passive process, which can make players feel constrained or disengaged. In contrast, implicit tutorials that teach through contextual design and interaction encourage active exploration and discovery. Vollmer (2016) in his talk summarized what tutorials should accomplish into 4 dimensions, which are teaching the player about the game's mechanisms, comforting the player so they are willing to keep playing, exciting the player to meet their expectations of what they might meet in the game and respecting the player's possibility of already mastering some specific skills from other similar games. He then introduced a list of things a designer of the tutorial should do, including 'telling the player what to do, staying out of the player's way, giving the player a safe space, and making the goals into puzzles' (Vollmer, 2016, 5:25). From his statement, a good tutorial should provide sufficient instructions and leave room for players to experiment based on their own curiosity. The result of research conducted by Yu and Liu (2022) also shows that players who learn through implicit tutorials report higher enjoyment, even though the tutorial was unclear and made the game more challenging, whereas players from the explicit version criticized the game for its slow tutorial, dullness, and lack of fun and wanted more autonomy (p.10). This demonstrates the higher efficiency of implicit tutorials. The goal of an effective tutorial is to allow learning through doing—enabling players to internalize skills while maintaining emotional engagement and freedom to explore.

Nonetheless, the drawbacks of an implicit tutorial would be its vagueness. In Yu and Liu's study, the results and player feedback also demonstrate that explicit guidance can be more effective in guiding the player, even if it is boring (p.14), where some testers commented on the implicit tutorial as unclear, as they failed to understand what the tutorial tried to teach them. Therefore, it demonstrated the idea of balancing player freedom and guided learning, where it is suggested 'a key question arises in how to facilitate experimentation while ensuring that the player learns how to play and does not become frustrated' (Andersen et al., 2012, p.67), which laid the groundwork for the subsequent discussion on the role of environmental storytelling in implicit tutorials.

2. Environmental Storytelling

By embedding narrative clues into the design of spaces, objects, and atmosphere, developers can communicate both story and gameplay information subtly, allowing players to engage in interpretative learning, which has demonstrated its potential to assist implicit tutorial design. Smith and Worch (2010) suggest that environmental narratives engage players by prompting them to connect scattered elements, apply problem-solving skills, and interpret meaning based on their own perceptions and experiences, which means such an approach can provide players with autonomy in investigating the game context. For the practical application of environmental storytelling, they suggested possible designs that emphasize the significance of keeping the puzzles and narratives in a coherent structure, such as 'echo the world at large' (Smith and Worch, 2010, p.41) and 'establish a discernible chain of events' (ibid., p.45). This allows designers to integrate puzzle structures to maintain narrative coherence throughout the game to aid players' freedom to explore after going through the tutorial.

Similarly, it is suggested that 'Environmental storytelling can also be used to encourage interaction and create new types of gameplay' (Vara, 2012, 4:35). In her talk, she focused on indexical storytelling, which is defined as 'using traces and indications to construct a story' (ibid., 49:48), and it is 'a strategy to engage the player in narrative gameplay' (ibid.), which supports the idea of its possibility to be applied to implicit tutorials by letting players explore independently. Furthermore, she suggested how indexical storytelling is used in practice, where she stated the concept of 'history of the world', and it was discussed through the dimensions of 'detective work, interpretation of remains and signposts and tutorials' (ibid., 15:25 – 26:15). These narrative constructions allow players to spontaneously try interpreting the scenes in the game, as well as affording players with navigation and in-game directions. All these perspectives demonstrate the potential application of environmental storytelling combined with implicit tutorials to enhance players' knowledge acquisition process by providing opportunities for them to experiment freely within the game context, while also maintaining the enjoyment of exploration and immersion.

3. Cognitive Psychology

Information processing

The effectiveness of a tutorial relates to how players learn, so it is necessary to understand how the brain processes information, which guides the way into the field of cognitive psychology. According to Hodent (2017), effective learning relies on perception, attention, motivation and emotion, and can be optimized by applying learning principles that strengthen memory formation. Possible learning principles include 'behavioural paradigm (looks at the stimulus–response relationship and how environment shapes learning), such as classical conditioning (passive associated learning) and operant conditioning (requiring an appropriate action), cognitive paradigm (emphasis on mental processes and on human limitations), and constructivism paradigm (posits that people construct knowledge through their interaction with the environment)' (Hodent, 2017, p. 94). She then provided techniques such as 'rewarding appropriately and avoiding punishing when they are learning about a new mechanic' (ibid.), also mentioning the importance of making players learn by doing and implementing purpose (meaning)into the process (ibid.). All these methods can be applied to tutorial design to guide players' behaviours. Hodent's framework of cognitive learning has built the foundation for this thesis to continue diving deeper into other cognitive theories to investigate how environmental storytelling elements could assist implicit tutorial designs through learning by doing.

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Affordance and Signifier

The Affordance Theory was proposed by Gibson (1979), which refers to the possibilities of action that an object or environment provides. For example, a chair affords to sit. This concept was refined by Norman (2013) with the term signifier, which refers to the perceptible signals of what can be done. These two concepts were frequently applied to user experience design in video games to tell players how to interact with certain in-game elements. Therefore, the affordance and the signifier would affect how players perceive the function of an object in-game, which suggests the importance of considering such properties of an object when it comes to tutorial designs where the game designers need to teach how to use a specific item. Hodent (2017) has given similar suggestions on guiding players' perceptions, where the design of the affordance of game elements would affect how intuitive a game will be.

Cognitive Overload

Cognitive Load Theory (CLT), developed by Sweller (1988), states that an individual's working memory has a limited capacity for information processing. If the limitation is exceeded, the overload would lead to inefficiency in knowledge learning. This is also supported by Hodent (2015)'s viewpoints, where she mentioned the limitation on players' multitasking skills when talking about attention. She used the example of an in-development version of a tutorial stage in Fortnite (Epic Games, 2017, cited by Hodent, 2015). 'There's a tutorial text about health regen that pops up at a moment when the player is obviously busy dealing with enemies. That's not when the brain has enough attentional resources to learn new things (or even perceive a pop-up window). (Hodent, 2015, para. 94)' This demonstrated how such a theory could be applied to tutorial designs.

Self-Determined Theory

Self-Determined Theory (SDT) is a framework built by Ryan and Deci (1985, cited by Ryan and Deci, 2000) that suggests intrinsic motivation is driven by autonomy (sense of control), competence (perceived ability), and relatedness (feeling of connection with others). Different types of motivations are also discussed, where intrinsic motivation refers to one's internal drive for satisfaction, which is opposite to extrinsic motivation, which refers to external factors such as rewards and punishments (Ryan and Deci, 2000). Their theories have been widely used in the field of game tutorial designs and have been demonstrated by various researchers to show their effectiveness for implicit tutorial design. Hodent (2016) used the example of The Legend of Zelda: Phantom Hourglass (Nintendo EAD, 2007, cited by Hodent, 2016) to show how designers utilize players' intrinsic motivation to guide their way through obtaining one specific item and teaching them how to use it. In the game, the player would discover poles without knowing what they are, which triggers their curiosity. Until the player receives the grappling hook and they would automatically understand how to use it. 'This reward becomes intrinsically motivating because the player already understands how to use it. This smart way to tease with locks before giving access to keys is a way to motivate the players intrinsically and meaningfully' (Hodent, 2016, para. 36). It also falls into Vollmer's opinion that a good tutorial should excite players, where intrinsic motivation could be a very powerful tool to achieve it. Yu and Liu's experiment also proved that players experience more joy when a tutorial provides them with more autonomy, which is in line with the SDT.

Narrative Transportation Theory

Green and Brock (2000) have conducted experiments to prove that when an individual is fully transported into the story's world, which means immersed or absorbed in the story mentally, they are more likely to experience higher levels of concentration and emotional engagement. This study provides insight into the application of narrative in the field of education to strengthen the effect on learning, as well as in designing game tutorials. A possible strategy would be to apply Vara's indexical environment storytelling, as previously suggested, where she suggested the possibility of using such elements to not only immerse players into the game world, but also guide players' way through autonomous thinking of what happened, making them carry out the process of learning by doing.

4. Information games

Definition

Information games may be categorized as puzzle or detective games but remain distinctly different from traditional puzzle games. As Martin (2020) suggested, the information game is not about guessing what the designers were thinking, but rather about letting players explore freely and develop their own theories within a well-structured game world. Information games are famous for relying heavily on rich stories and well-illustrated worldbuilding, presented in a non-linear way, so players decide how they would like to proceed rather than being forced to follow specific orders. Therefore, implicit tutorials would be inevitable for such a genre. Martin also mentioned the importance of environmental storytelling in such games, using words from Jon Ingold, the co-creator of Heaven's Vault (Inkle, 2019). 'The information you figure out from reading the environment isn't just color, but core: You need it to be able to progress.' (cited by Martin, 2020, para. 12), which demonstrated how frequently implicit tutorials and environmental storytelling would be integrated into an information game.

The types of players

Bartle (1996) has categorized 4 types of players in his theory, which were achievers (vigorously pursuing game-related goals), explorers (trying to find out as much as possible about the virtual worlds), socialisers (applying role-playing and communicating with fellow players) and killers (causing distress to other players). When discussing information games, it is easy to notice that this genre would naturally attract explorer-type players, due to its nature of investigating the game world to solve mysteries. Therefore, studying the psychology of explorers would help designers of information games to understand what design techniques should be considered to encourage freedom of exploration. Explorers tend to be driven by intrinsic motivations such as pure curiosity to figure out what is happening around them in the game worlds, which is also proven as a very strong driving force that can guide players' behaviours and offer them autonomy to theories such as SDT.

MATERIALS AND METHODS

This thesis aims to examine how environmental storytelling functions as a tool for implicit tutorial in information games to balance instructional effectiveness—through learning-by-doing and improved memory retention—with player engagement driven by intrinsic motivation and active learning. To achieve this, qualitative approaches based on secondary sources will be conducted in the form of case studies to analyze how

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environmental storytelling elements are implemented in implicit tutorials in information games, with the support of cognitive psychology frameworks discussed in the literature review section.

The example information games selected as case studies include Chants of Sennaar (Rundisc, 2023) and Outer Wilds (Mobius Digital, 2019). These examples are selected for their strong use of narrative-driven implicit tutorials that support player puzzle-solving and exploration without relying on explicit instruction. Conversely, Myst: Masterpiece Edition (Cyan Worlds Inc, 1999) is included to illustrate the limitations of an implicit tutorial integrated with environmental storytelling, which leads to negative effects on players' learning and engagement.

RESULTS

CASE STUDIES

1. *Chants of Sennaar*

The first case study is *Chant of Sennaar* (Rundisc, 2023), a puzzle-based game in which the player progresses by deciphering glyphs of several different languages through observation, contextual clues, and interaction with the environment. The game is built upon strong environmental storytelling, as learning occurs through exploration and interpretation of spatial design, symbols, and behaviours of in-game characters. This makes it a representative example of how implicit tutorial elements can guide player understanding while supporting independent problem-solving and narrative engagement.

The tutorial session of this game would be considered the first door puzzle after the player enters, where the protagonist wakes up and starts exploring the tower. During this session, the balance between explicit and implicit instructions is well maintained, where direct pop-up windows are only for prompts of input controls or user interface guidance, such as clicking to move and clicking on a specific button to open the journal (Figure 1), while implicit instructions that made flexible use of environmental storytelling were implemented for the main puzzle which played a crucial role to convey the core mechanic of translating the glyphs. This allows players to quickly get familiar with the basic controls, so more time can be spent on mastering the key skill of learning the meaning of glyphs from careful observation of the surroundings through learning by doing, which is in line with Vollmer (2016)'s idea of giving sufficient instructions while letting players experiment independently, as well as supporting Andersen et al (2012).'s opinion of balancing between teaching and entertaining.

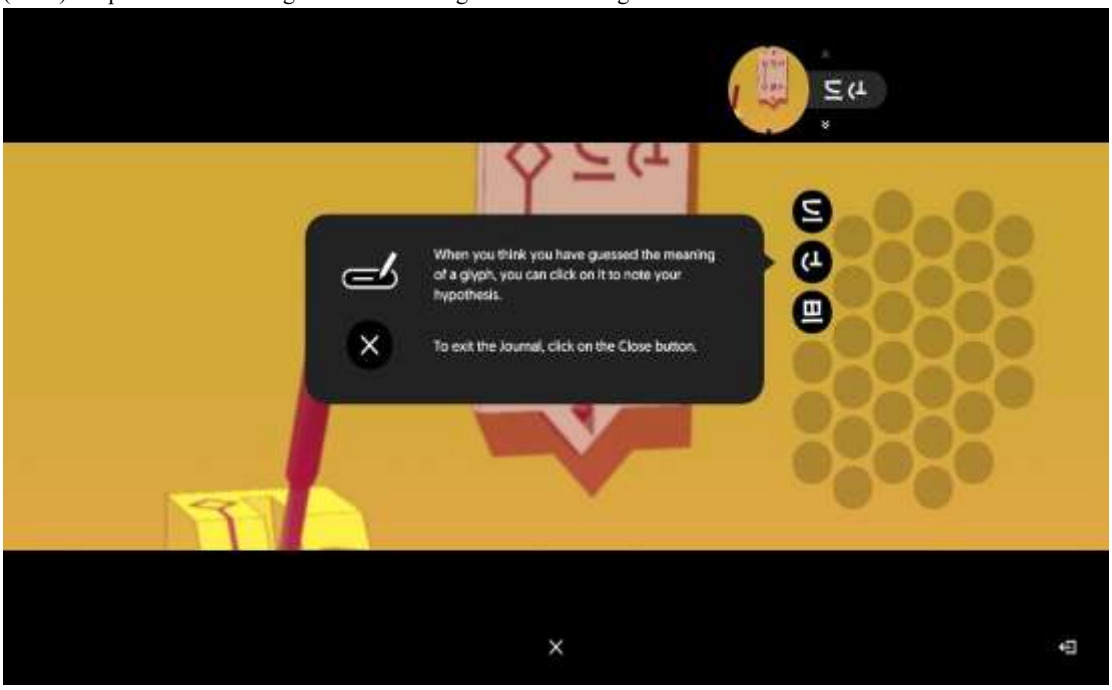


Figure 1: Explicit pop-up windows used for instructions for basic control. (*Chants of Sennaar, Rundisc, 2023*) screenshot by author (2025)

Since puzzles in *Chants of Sennaar* are based on interpreting environmental storytelling, the designers need to use various elements to guide players' perception. Consequently, an effective approach introduced is the affordance and signifier suggested by Gibson (1979) and Norman (2013), which has also been discussed by Hodent (2017), where the initial door puzzle would be a very simple and straightforward example to show how this approach is combined with an implicit tutorial to guide players' thinking and behaviours. The puzzle starts with the player encountering a door, a lever and a sign with unknown glyphs on it next to the lever (Figure 2 and Figure 3). By simply interacting with the lever to pull it back or push it over, the obvious feedback of the animation of the door being closed or opened will be shown. Therefore, by observing the pattern of three different glyphs arranged on the sign and the feedback of the door, players can easily build the link between the meanings of the glyphs with the scenario, using the existing knowledge of a door's affordance of being closed or opened from everyday life. The puzzle is designed based on the principle of affordance and signifier, making it simple, understandable and intuitive, which is perfect for a beginning-level puzzle to put into the tutorial.

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Figure 2: The door, the lever and the sign. (Chants of Sennaar, Rundisc, 2023) screenshot by author (2025)

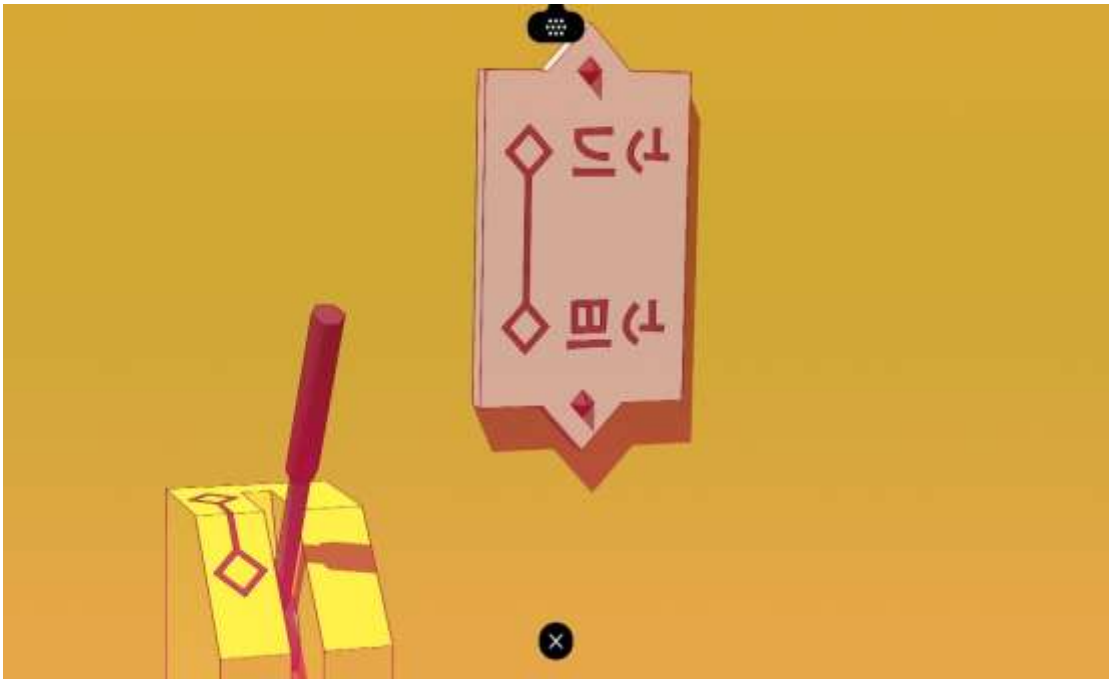


Figure 3: The glyphs shown on the sign. (Chants of Sennaar, Rundisc, 2023) screenshot by author (2025)

After the player completed the door puzzle, the next puzzle required them to adjust the row of levers according to a specific pattern shown on the sign next to the levers (Figure 4 and Figure 5). Based on what has been deducted from the previous scene, the player would easily know the correct order. This is another neat puzzle design, which is based on the lever's affordance of being used as a switch to open or close something. Therefore, this process enhanced players' memory of the newly gained knowledge, as well as the learning process of observing environmental elements to understand specific scenarios using a carefully designed learn-by-doing experience. This is also aligned with Hodent's (2017) framework of players' learning, where perception is achieved with the assistance of affordance and signifier, and memory is strengthened with repetition. Similar puzzle designs, which involve the observation and interaction with environmental storytelling elements to understand specific meanings of glyphs, would be seen throughout the later stages of the game. As a result, such a series of easily understandable puzzle designs would benefit players' further exploration later in the game by getting them familiar with the patterns of puzzle designs in their first few minutes of gameplay.

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Figure 4: The next puzzle involves applying newly learnt knowledge after going through the door. (*Chants of Sennaar, Rundisc, 2023*) screenshot by author (2025)



Figure 5: How the player applies their newly gained knowledge (the meanings of glyphs) to understand the sign. (Chants of Sennaar, Rundisc, 2023) screenshot by author (2025)

To sum up, puzzle designs for the tutorial in *Chants of Sennaar* made flexible use of the affordance of environmental storytelling elements and combined with signifiers to implicitly guide players' perception and deduction process, as well as followed up with advanced puzzles for players to review what they have just learnt to solidify their memory. This process allows players to get familiar with the puzzle design patterns of observing and interacting with the environmental clues to understand the meanings of glyphs, therefore aiding their further exploration in the later gameplay.

2. *Outer Wilds*

The second study is *Outer Wilds* (Mobius Digital, 2019), which is renowned for its puzzle design that heavily relies on its non-linear narrative structure embedded in a well-crafted world-building. Alex Beachum, the creative director of *Outer Wilds,* described the game as 'curiosity-driven' (Full Indie, 2023, 2:10), which refers to 'gathering information about the environment out of a desire for knowledge' (ibid.), where curiosity has already been demonstrated by Ryan and Deci (2000) to be a compelling intrinsic motivation. The game's tutorial design also reflects this principle, employing various environmental storytelling techniques that stimulate players' curiosity and encourage them to explore the environment and gather information beyond the tutorial phase.

As the game's core mechanics are closely linked with its story, the tutorial is embedded in a narrative context in which the player is the newest member of an alien (the *Hearthians*) space program investigating the solar system they live in on their first launch day. The tutorial starts with the player waking up near the launch tower and being told by a non-player character (NPC) sitting nearby to go to the observatory to collect the launch code, which allows the player to activate the elevator to the launch tower before they can go into space (Figure 6). On the way towards the observatory, the player would encounter other NPCs, who are part of the tutorial to teach about how to use specific items, such as the signal

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scope that can track different signals to find hidden information in the later gameplay. By integrating the tutorial with narratives, it allows the whole teaching process to be implicit, without forcing players to read forced instructions. It aligns with Green and Brock's (2000) Narrative Transportation Theory, where combining learning with narrative contributes to an individual's learning effect. Moreover, other environmental storytelling elements can also be found integrated into the implicit tutorial to subtly guide players' in-game behaviours.



Figure 6: A clear goal is provided by the NPC at the start of the tutorial. (*Outer Wilds*, Mobius Digital, 2019) screenshot by author (2025)

At the start of the first loop, the player will wake up and witness an explosion occurring near the large green planet in the sky (Figure 7). This is the first curiosity point the player encounters after the game starts. This moment immediately draws players' attention and stimulates curiosity, increasing the likelihood that players will aim for the site of explosion to investigate it further after the tutorial session, and they will find out that this incident is related to further narratives of one of the major mysteries later in the game. This is one of the examples of how *Outer Wilds'* use of environmental storytelling fulfils Vollmer's (2016) goals of a tutorial, where something strange enough appears to excite players.



Figure 7: The explosion at the beginning of the tutorial and each loop. (*Outer Wilds*, Mobius Digital, 2019) screenshot by author (2025)

Another point worth mentioning is the neatness of the arrangement of environmental elements. In the Alpha version of *Outer Wilds*, the original curiosity point was a meteor that crashed into the *Hearthian village*, instead of the explosion in the release version, but it turned out that there was an excess of other elements in the village that could lead to the distraction of players' attention (Figure 8). This is in line with Hodent's (2017) suggestion on players' limitations on multitasking, where redundant elements could lead to cognitive overload stated by Sweller (1988), therefore

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damaging the effect of learning. As a result, the release version of *Outer Wilds* has only one major environmental storytelling element left up in the sky for designers to control players' attention and leave traces that enable players' further exploration based on a clear curiosity towards space.



Figure 8: The Alpha version of *Outer Wilds* before removing *the* redundant elements. (Full Indie, 2023, 7:38)

The last part of *Outer Wilds*' tutorial session is the *Hearthian Museum*, the destination the player was told about at the beginning of the tutorial. The museum exhibits serve as an introduction to several essential items for making progress in the later stages of the game. The most notable example is the *Nomai Texts* (Figure 9), which are some unique blue spiral-shaped patterns that convey important information, serving as one of the core mechanics of the game that appear in many of the explorable locations (Figure 10). The player would encounter the *Nomai Texts* for the first time in the museum and learn that by approaching and interacting with objects that contain these patterns, they can gain further information about the story that happened in specific environments and clues to solve specific mysteries. By using such techniques, a connection between the existence of *Nomai Texts* and positive feelings of curiosity being fulfilled is built. As mentioned by Alex Beachum, the only reward for players' exploration in *Outer Wilds* is the fulfilment of curiosity after obtaining information (Full Indie, 2023). The *Nomai* text would be one way to deliver this reward. According to Hodent's (2017) opinions on learning principles, this aligns with the behavioural paradigm, which the stimulus of *Nomai Texts* triggers the response of positive feeling, based on the theory of classical conditioning, therefore making players more likely to repeat the behaviour of searching for similar patterns to gain more information and fulfil their curiosity. As a result, environmental storytelling could motivate players and shape their behaviours to explore further in the game, which also provides insight for designers to plan the arrangement of clues that communicate important information to the player and guide them to solve specific puzzles.

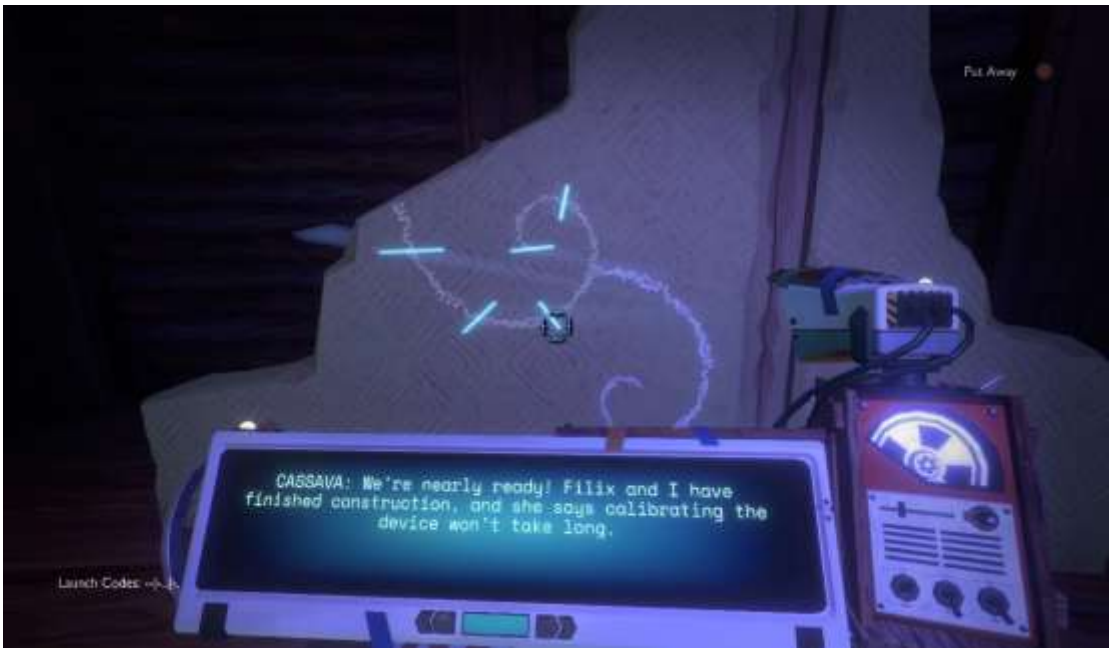


Figure 9: The first location players encounter with the *Nomai Texts* in the *Hearthian Museum.* (*Outer Wilds*, Mobius Digital, 2019) screenshot by author (2025)

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Figure 10: Example of other locations where the *Nomai Texts* can be found. (*Outer Wilds*, Mobius Digital, 2019) screenshot by author (2025)

To summarize, the uniqueness of the use of environmental storytelling elements in *Outer Wilds* comes from its combination with its structured narrative and worldbuilding, as well as how the designers implicitly control players' attention and stimulate their intrinsic motivations to form players' autonomous behaviours at a very early tutorial stage of the game.

3. *Myst: Masterpiece Edition*

The last case study is *Myst: Masterpiece Edition* (Cyan Worlds Inc, 1999). It is an early puzzle and adventure game that places players on a mysterious, deserted island and requires them to solve puzzles through environmental exploration and logical deduction. However, despite its innovation in interaction with the in-game world, it is also criticized for its insufficient instructional support and suffers from players' complaints of confusion and disengagement. This makes it a relevant case for examining the limitations of implicit tutorial design when not adequately balanced with guidance or narrative structure.

At the start of *Myst*, no structured tutorial is provided to familiarize players with core mechanics. Instead, everything is expected to be discovered through players' spontaneous exploration of the game environment. Therefore, it could take players a long time to make very little progress due to the disarrangement of environmental storytelling elements. In the first scene of the game (Figure 11), the most obvious elements are the large structure and the nearby switch, while a less noticeable sliding door on the left of the screen can be accessed simply by clicking. Apart from these elements, there are also a range of other accessible elements on the whole island which relate to later stories and puzzles. Consequently, players like AustinMcConnell (2023) suggested his experience of 'spending way too long on the island before finally figuring out that this sliding door was not opened by having a particular pattern of switches in the correct position, but rather literally just clicking on it to open it (AustinMcConnell, 2023, 4:20-4:40).' Such confusion might come from the disorganized environmental elements which might mislead players' perception and attention. The game does not effectively highlight essential elements and instead spreads multiple irrelevant interactable objects across the scene, leading to cognitive overload. This aligns with Hodent's (2017) observations on the limitations of attention and multitasking. In contrast to *Outer Wilds*, which manages redundancy to reduce cognitive overload, *Myst* illustrates how a lack of consideration in designing environmental storytelling elements could lead to negative effects on players' comprehension of the game.

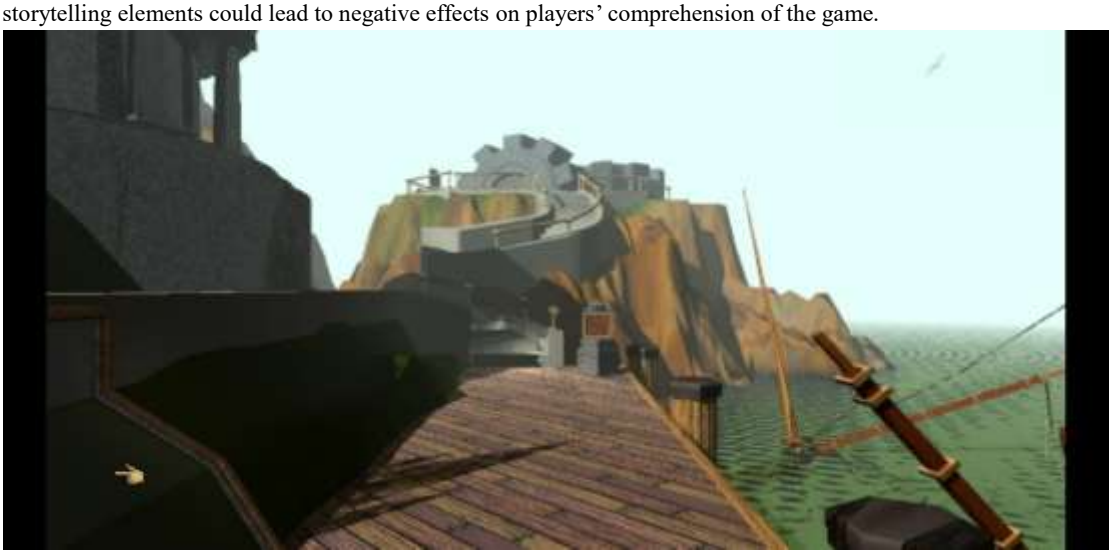


Figure 11: The first scene players encounter with the giant structure ahead and a switch next to it, while in the bottom left corner is the sliding door. (*Myst: Masterpiece Edition,* Cyan Worlds Inc, 1999)

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While *Myst* incorporates environmental storytelling elements by embedding interactive components into the broader story context, the connection between narrative and gameplay progression is not consistently structured. The in-game elements are not linked with the story, which makes it more difficult to understand their functionality. Walker (2023) complained that '… these interactions are made all the more infuriating by never knowing what clicking the cursor will do. If I click on this chair will I get closer to it, move it, look under it, take a step back from it, or most likely, turn around 180 degrees for no reason at all (Walker, 2020, para.19).' Such ambiguity may make it difficult for players to construct coherent meaning from what they encounter, which failed to fulfil Narrative Transportation Theory (Green & Brock, 2000), where the environmental storytelling elements did not work as a support for both puzzle-solving logic and narrative engagement, therefore damaging the effectiveness on players' learning towards both mechanics and storytelling.

In summary, in *Myst*, although environmental storytelling strategies are applied, their effectiveness is limited by the lack of clarity and opportunity for interpretation of the narrative. This case illustrates that the successful application of environmental storytelling in an implicit tutorial depends on the design strategies of narrative and interaction experiences, therefore emphasizing the importance of balancing between instructions and autonomy.

DISCUSSION

By analyzing the three case studies, several patterns of implicit tutorial designs, combined with environmental storytelling following cognitive psychology principles, can be illustrated. Both Chants of Sennaar and Outer Wilds demonstrate that implicit tutorials are most effective when environmental elements are structured to assist learning while maintaining players' independent exploration. In these games, players learn core mechanics through clear perception supported by affordances and signifiers. Also, cognitive overload can be prevented by guiding attention towards essential elements and removing unnecessary complexity. Moreover, environmental elements can be useful for managing players' intrinsic motivations, such as curiosity, to encourage spontaneous exploration. All these techniques are conducted through contextual experiences, which are strongly connected with narrative environments. These examples align with cognitive studies, including Hodent's framework, which strengthens the effect of players' learning, as well as SDT and Narrative Transportation Theory, which engage players in the game world to enhance their willingness to autonomously investigate.

In contrast, Myst: Masterpiece Edition reveals the limitations of implicit tutorial design when environmental storytelling lacks instructional clarity or coherence. Although Myst was a pioneer in employing environmental narrative elements for gameplay, its vague affordances and inconsistent structure can disturb perception towards the game world, therefore leading to misunderstanding. The disarrangement of in-game elements can also distract players' attention from important clues. As a result, it failed to apply Hodent's framework on players' learning, making players misinterpret puzzle designs and discouraging their motivation for further exploration. From the perspective of Narrative Transportation Theory, Myst also demonstrates that poorly integrated environmental cues may prevent players from becoming fully immersed in the narrative world, therefore weakening the potential learning motivation and effectiveness associated with practical experiences.

As a result, these analyses suggest that the success of implicit tutorials in information games depends not merely on the presence of environmental storytelling but on the clarity and arrangement techniques of narrative elements. The discussion, therefore, emphasizes the importance of balancing instruction and freedom. While implicit tutorials aim to empower players through the independent experiment of learning by doing, they also require carefully planned instruction and narrative to prevent misinterpretation and cognitive overload, as well as stimulate intrinsic motivations towards further exploration.

CONCLUSION

This thesis investigates how environmental storytelling supports the effectiveness of implicit tutorial designs on players' learning of core game mechanics and enables their further autonomous exploration in the game world of information games. With the foundation of cognitive psychology, case studies of Chants of Sennaar and Outer Wilds proved how environmental storytelling strengthens perception, memory and attention towards essential in-game elements that teach players about important information and triggers intrinsic motivation that drives players' independent exploration for the later stage of the game. Myst: Masterpiece Edition serves as a counterexample of how the misuse of environmental elements can lead to the distraction of players' perception and attention. All these examples demonstrate the importance of balancing instruction and entertainment in an implicit tutorial.

By analyzing both effective and ineffective implementations of environmental storytelling for implicit tutorials, this study highlights valuable insights for game design practice. However, there are still certain limitations that need to be acknowledged. Firstly, the study primarily focuses on information games, based on the premise of explorer-type players suggested by Bartle (1996), which means the approach may not apply to other genres of game or other types of players, such as achievers who are more driven by the desire to complete in-game goals, rather than curiosity. Secondly, the thesis is based on qualitative case studies and secondary sources, and does not include empirical testing, which limits the generalizability of the findings. Future research could expand by conducting player-based experiments to assess how different tutorial strategies affect learning outcomes across diverse player types and game genres, enabling the comparison between different design approaches, therefore providing the designers with more insights on how to instruct and entertain the player most effectively.

Overall, this research demonstrates that environmental storytelling can be a powerful tool for implicit tutorial design when carefully integrated with an understanding of player cognition and motivation, but its success ultimately relies on thoughtful implementation and contextual relevance. Future tutorial development should continue to focus on the balance between instruction and engagement, allowing players to learn through spontaneous practical experiences.

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ETHICAL AND COMPLIANCE STATEMENTS

This research is conducted in accordance with academic integrity and ethical standards. The study is based entirely on secondary data, including published literature and publicly available game materials, and does not involve human participants, personal data collection, or experimental procedures. All sources have been appropriately cited to avoid plagiarism. The author declares no conflict of interest and confirms that the similarity index of this manuscript complies with journal requirements. No external funding was received for this research.

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