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Research Article

The role of narrative in misinformation games

Several existing media literacy games aim to increase resilience to misinformation. However, they lack variety in their approaches. The vast majority focus on assessing information accuracy, with limited exploration of socio-emotional influences of misinformation adoption. Misinformation correction and educational games have explored how narrative persuasion influences personal beliefs, as identification with certain narratives can frame the interpretation of information. We created a preliminary framework for designers seeking to develop narrative-driven misinformation games that synthesizes findings from psychology, narrative theory, and game design. In addition, we conducted a narrative-centered content analysis of existing media literacy games.

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Research questions

- How can the narratives of existing misinformation games help address psychological drivers of misinformation?
- What aspects of narrative design are important to consider in the context of games for misinformation education?

Essay summary

- We compiled findings from misinformation psychology, game studies, and narrative theory to inform a content analysis of how existing misinformation education games are utilizing narrative to address psychological drivers of misinformation.
- Researchers across the fields of misinformation, educational games, and communication theory have used narrative to 1) promote identification with opposing viewpoints, 2) reduce counterarguing and reactance, and 3) facilitate connection to educational outcomes.
- We summarize our findings into the misinformation game narrative design (MGND) framework, which can be used by researchers and designers to create game-based misinformation interventions targeted at specific audiences.

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Implications

Misinformation and disinformation have many widespread and often harmful effects on society due to their ability to shape people's beliefs and behaviors (Ecker et al., 2022). This has led to calls to feature misinformation more predominantly in mainstream media literacy curricula (Dame Adjin-Tettey, 2022). Media literacy was shown to positively correlate with correct determination of the accuracy of online information (Kahne & Bowyer, 2017).

Games have been suggested as a promising educational medium for effective media literacy interventions (Chang et al., 2020). The immersive nature of games allows players to creatively engage with real-world situations as thought experiments (Schulzke, 2014), allowing for a safe space to investigate complex issues. Indeed, researchers and educators have created games that aim to improve media literacy (Contreras-Espinosa & Eguia-Gomez, 2023; Kiili et al., 2023) and effectively inoculate players from misinformation and disinformation (Basol et al., 2020; Maertens et al., 2021; Roozenbeek & van der Linden, 2019; van der Linden et al., 2017). However, there are limitations to the existing body of game-based misinformation interventions, namely their lack of theoretical variance. The majority are based in inoculation theory (Kiili et al., 2023), and recent work has suggested that inoculation-based interventions may simply increase the likelihood of conservative reporting, rather than critical engagement with misinformation (Modirrousta-Galian & Higham, 2023). While informative, these interventions primarily address rational processes of misinformation correction (i.e., teaching basic media literacy competencies). However, the processing and subsequent adoption of misinformation is also heavily influenced by psychological drivers and personal belief (Ecker et al., 2022). Thus, it is essential for designers of misinformation education games to facilitate player exploration of the socio-emotional influences that can lead to the acceptance and spread of misinformation.

Research on misinformation correction and educational games has explored a common method to engage with people on an emotional basis: narrative (Cohen et al., 2015; Domínguez et al., 2016; Iten et al., 2018; Mahood & Hanus, 2017; Ophir et al., 2020; Sangalang et al., 2019). We define narrative as a story that contains event(s), character(s), setting(s), structure, a clear point of view, and a sense of time (Chatman, 1978). Reading, processing, and identifying with narratives is a fundamental component of how we organize our interpretations of reality (Bruner, 1990). However, despite the effectiveness of narrative persuasion in both misinformation correction (Cohen et al., 2015; Ophir et al., 2020; Sangalang et al., 2019) and educational games (Domínguez et al., 2016; Iten et al., 2018; Mahood & Hanus, 2017), current misinformation games are notably lacking in narrative-driven learning mechanisms, as their primary focus tends to be on improving skill-based or knowledge-based information literacy (Contreras-Espinosa & Eguia-Gomez, 2023). There is a strong potential for using narrative as a tool for prompting player empathy and emotional connection within misinformation education (Grace & Liang, 2024).

Misinformation game narrative design (MGND) framework

We synthesized possible benefits of narrative-based education games from communication theory and game design and developed an understanding of how key narrative elements, such as those presented in Chatman (1978), may synergize with game mechanics to emotionally connect with players. Using these learnings as a basis, we then performed a content analysis of current misinformation education games. We used our findings to map an initial framework for designers seeking to create narrative-driven misinformation games. We intend to aid these designers, as well as educators and practitioners, in tying certain narrative elements to their intended learning outcomes. Our proposed design framework, the misinformation game narrative design (MGND) framework, consists of ten dimensions, each of which contains several elements. We began by choosing relevant dimensions (i.e., structure, setting, and

characters) from Chatman's definition of narrative (1978). We then integrated game design elements, such as player *agency* and *dynamics*, as well as considerations from misinformation psychology, namely the *psychological drivers* and the *correction type* the designer is creating. The *intended audience* must also be centered through the design. It is possible for a game narrative to have multiple elements within each dimension or exist on a sliding scale between two elements. The dimensions are as follows: educational goals, intended audience, psychological drivers, narrative structure, setting, tone, player agency, player morality, ending, and player dynamics.

Educational goals: What are the intended educational goals? We derived the following goals from Barzilai and Chinn's (2020) educational lenses for a post-truth world:

(1) *Addressing not knowing how to know*. Learners may have gaps in their knowledge and skills for critically dealing with misinformation in digital spheres. Educational games can remedy this by promoting civic, digital, and scientific literacy, as well as inoculating against misinformation.
(2) *Addressing fallible ways of knowing*. Adoption of misinformation is strongly influenced by cognitive biases. Educational games can mitigate this by teaching players about cognitive and socioemotional biases and cultivating epistemic vigilance through evaluating the reliability and trustworthiness of information.
(3) *Addressing not caring enough about truth*. Misinformation is often propagated by actors who do not necessarily care that they are being misleading or if they are being misled. Educational games can address this by teaching players about the potential consequences of not taking misleading information seriously.
(4) *Addressing disagreeing about how to know*. People have ways of seeing the world that are often in conflict with each other. Educational games should emphasize authoritative sources and incorporate debunking strategies when necessary. At the same time, they should teach players how to discuss and evaluate differing beliefs while recognizing and coordinating various epistemologies.

Goals 1 and 2 focus on information literacy and prebunking and are frequently addressed in the current body of misinformation games**.** However, there is currently limited exploration of goals 3 and 4, and we provide examples of how games can be framed around those goals in Appendix C. All approaches have benefits and drawbacks, but one might be preferable depending on the context, such as the audience or the type of misinformation.

Intended audience: Who is the intended audience? Games can be created for a (1) *general audience*, (2) *specific audience*, or (3) *somewhere in between*. Designing for general audiences increases the potential reach of the game, while designing for targeted communities creates avenues for designers to utilize narrative affordances. For example, designers could consider creating characters with which target groups may very strongly identify and use those characters as vehicles to explore various aspects of players' beliefs. This has the potential to engage players in discussions with reduced risk of reactance and counterarguing.

Psychological drivers: What psychological aspects of misinformation does the game touch upon? In our content analysis, we used Shane's (2020) framework as a basis for identifying a handful of psychological drivers addressed by existing misinformation games (1–5), and we also included one additional driver, emotion, as some games address the influence of emotive information and emotional state on false beliefs (Ecker et al., 2022):

(1) *Third person effect* (the tendency to assume that misinformation affects others more than oneself)

(2) *Social pressure* (the inclination to repost and believe misinformation shared by one's social circles)
(3) *Confirmation bias* (the tendency to believe information that verifies one's existing beliefs)
(4) *The rabbit hole effect* (a pathway leading towards more extreme misinformation)
(5) *Heuristics* (indicators used to make quick judgments)

In addition, designers could also consider other psychological drivers or social factors, such as cognitive dissonance, motivated reasoning, or cognitive miserliness. This would also help establish more specific learning outcomes of the game.

Narrative structure: How does the story progress from beginning to end? We identified three possibilities for the progression of the story: (1) *linear*, where the story follows a fixed and predictable path, (2) *plot twist*, where players are abruptly introduced to new information halfway through an otherwise linear story, and (3) *branching*, where there are multiple paths and multiple endings that the player can discover based on their actions. These choices may have an impact on how people feel at the end of the game, and prompt reflection on their role or agency. Furthermore, different modalities may afford different structures. For example, a linear structure would work better for a digital escape room than a physical one, where players can more efficiently examine different parts of the puzzle in parallel.

Setting: Where does the story take place? The story can take place in either realistic or fantastical setting. A *realistic setting* provides an opportunity for a game to reflect prominent mis- or disinformation issues from the modern day. On the contrary, *a fantastical setting* may allow for a narrative that can appeal to broader audiences, especially in polarized communities and increase the longevity of the game as it will not feel out of date when new misinformation issues become prevalent. Several existing misinformation games chose a dystopian approach, a fantastical setting that still affords serious conversations about the harm of disinformation present today. Designers could also choose to integrate elements from both: realistic elements to keep the game grounded, but with added fantastical elements to engage younger audiences.

Tone: How does the story convey the topic of misinformation to players? Games can take *a humorous tone* to lighten the situation, *a serious tone* to underline the importance of the topic, or incorporate elements of both. This can be determined by considering the audience and the type of misinformation issues that are being discussed in the game. For instance, it would be important to be respectful when incorporating certain misinformation scenarios that harmed people in the real world.

Player agency: Do the game mechanics allow the player to make choices that affect the narrative in significant ways? Based on players' ability to influence the narrative, the game can allow for different levels of their agency: (1) *high agency* that permits players to make impactful choices and witness their effects, (2) *no agency* that keeps players bounded within a set narrative, and (3) *limited agency* that allows players to make choices, but none that are particularly impactful. In some situations, providing agency may be deemed especially important (e.g., creating a game that empowers players to take action against misinformation), but in other situations, having players experience one particular path is critical for meeting the learning goals (e.g., having players fall for misinformation themselves to discuss the third-person effect).

Player morality: What role does the player character serve within the narrative? In terms of ethical considerations, characters can take on different roles: (1) a *hero*, by choosing morally correct options, (2) a *villain,* by actively sowing discord, or (3) *a morally gray character*, by carrying out questionable actions despite their personal reservations. Taking the perspective of a villain may make the game more engaging,

but it might be less suitable in certain misinformation situations. Taking on a role of a morally gray character may prompt players to reflect on the choices they make after the gameplay.

Ending: What note does the story finish on? Depending on the finishing note, the story can conclude with (1) *a positive ending* that might provide players with hope that their actions can make real change, (2) *a negative ending* that may serve as a reminder of the real harm caused by misinformation, and (3) *variable endings*, in which the ending is determined by players' in-game actions. Variable endings may work especially well in social play situations where players get to discuss their choices with others and empathize with the decisions others may have made in the game (Yin & Xiao, 2022).

Player dynamics: How do players interact with each other, if at all? Players' ability (or lack thereof) to interact with each other during the game determines player dynamics. Many narrative games are *individual*, but some modalities, such as escape rooms or tabletop games, are suited to *social* play, in which players can progress through the narrative and construct elements of the story together. Social play could especially be useful for games that require deeper reflection and discussion or that aim to influence players' attitudes or beliefs, as opposed to more skill- or knowledge-based games.

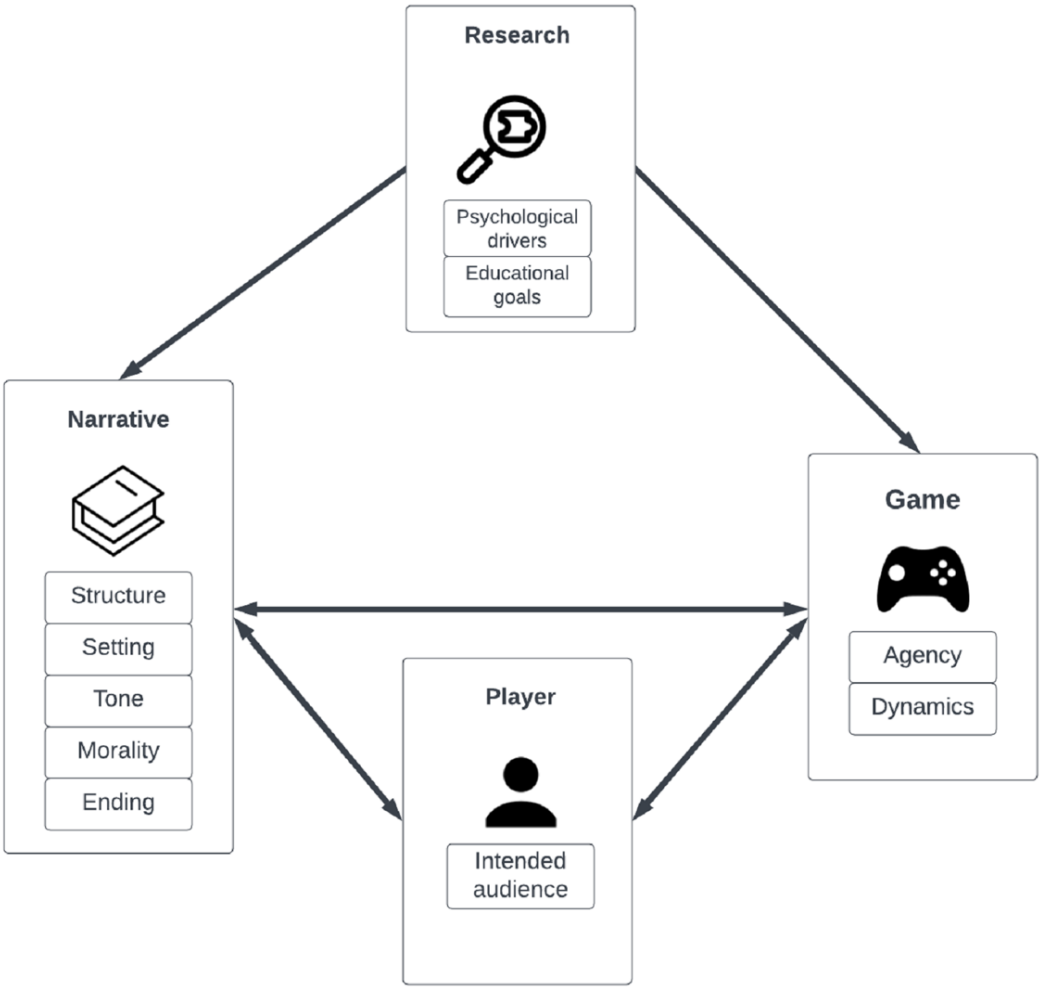

Figure 1. A summary of the misinformation game narrative design (MGND) framework, separated by its four overarching components.

In sum, the MGND framework allows the designer to carefully consider with which misinformation-related experiences they would like the players to engage through the narrative and game mechanics. This framework could be used in tandem with other game design frameworks, such as the Mechanics, Dynamics, Aesthetics (MDA) framework (Hunicke et al., 2004), to co-design experiences for specific stakeholders and their associated misinformation contexts. We plan to use the MGND framework to co-design culturally specific narratives through our work with universities and libraries internationally.

Evidence

We build from the theoretical background and present three specific hypotheses as to how narrative could supplement the outcomes of playing misinformation games.

Hypothesis 1: Narrative can facilitate identification with opposing viewpoints.

People who have already adopted misinformed beliefs require debunking rather than prebunking. This has led to the suggestion of implementing counter-narratives as a way to deconstruct strongly held beliefs (White, 2022), such as counteracting misinformed beliefs among smokers (Ophir et al., 2020; Sangalang et al., 2019). Evoking a strong emotional response and identification with the main character was shown to have mediating effects on misinformed beliefs (Cohen et al., 2015; de Graaf et al., 2012; Ophir et al., 2020). In game studies, research has shown that perspective taking in virtual environments increases empathy (Estrada Villalba & Jacques-García, 2021). Players are capable of feeling deep emotional attachment to and identification with characters in narrative games (Bopp et al., 2019; Hefner et al., 2007; Sierra Rativa et al., 2020). This increases situational empathy for that character, regardless of their morality (Happ et al., 2013; Iten et al., 2018). Narrative game environments also provide a medium for players to understand other players with whom they may not necessarily identify closely in real life (Burgess & Jones, 2021). Though players may choose different narrative branches, they are capable of empathizing with the rationale behind other players' decisions without necessarily agreeing with said reasons (Yin & Xiao, 2022).

Hypothesis 2: Narrative can reduce reactance and counterarguing.

Counterarguing against an attempted misinformation correction can strengthen an individual's belief in it (Ecker, 2017). Narrative's ability to reduce reactance offers a solution in this respect (Moyer-Gusé, 2008). Slater and Rouner's (2002) extended Elaboration Likelihood Model, which builds from Petty and Cacioppo's (2012) Elaboration Likelihood Model, suggests that the cognitive processing of narratives suppresses resistance to persuasive messages contained within the story. The effectiveness of the messaging is associated with the degree of transportation into the story and identification with the characters (Green & Brock, 2000), which led Slater and Rouner (2002) to further argue that transportation and counterarguing are mutually exclusive. In previous work, Slater and Rouner (1996) found that narrative messages were more persuasive than factual arguments, particularly for participants with pre-existing attitudes that countered the persuasive messaging in question. There is also evidence that narratives can overwrite preexisting attitudes regarding controversial issues (Igartua & Barrios, 2012; Slater et al., 2006): Both narrative and effective debunking correctives require an individual to continuously update their mental models (de Vega, 1995; Wilkes & Leatherbarrow, 1988). The process of creating an alternative mental model that replaces the original can reduce the effects of misinformation (Johnson & Seifert, 1994).

Hypothesis 3: Narrative can facilitate educational gains.

Narrative-centered learning environments (Lester et al., 2013) are more effective in promoting enjoyment and knowledge acquisition than traditional game-based learning environments (Abdul Jabbar & Felicia, 2015; Jackson et al., 2018; McQuiggan, Rowe, Lee, et al., 2008; McQuiggan, Rowe, & Lester, 2008; Naul & Liu, 2020). Similar to practitioners building expertise in a domain, games allow players to develop increasingly complex skills through continuously challenging them to achieve mastery in order to progress (Gee, 2003). In addition to skill acquisition, narrative-centered educational games can also spur attitude change. In a review of narrative-centered educational games, skill acquisition (measured in 33 out of 130 reviewed studies) and attitude change (measured in 15 out of 130 reviewed studies) were the most effective educational outcomes (Jackson et al., 2018). This presents an opportunity for designers of misinformation education games to not only allow for skill-building, but to also engage in the attitude changes required for debunking false beliefs.

Methods

Our investigation was two-fold. First, we synthesized findings from misinformation psychology, narrative theory, and game design principles to compile three affordances of narrative in gamified misinformation education contexts. These were presented in the Evidence section and served as guiding principles for our content analysis, described below.

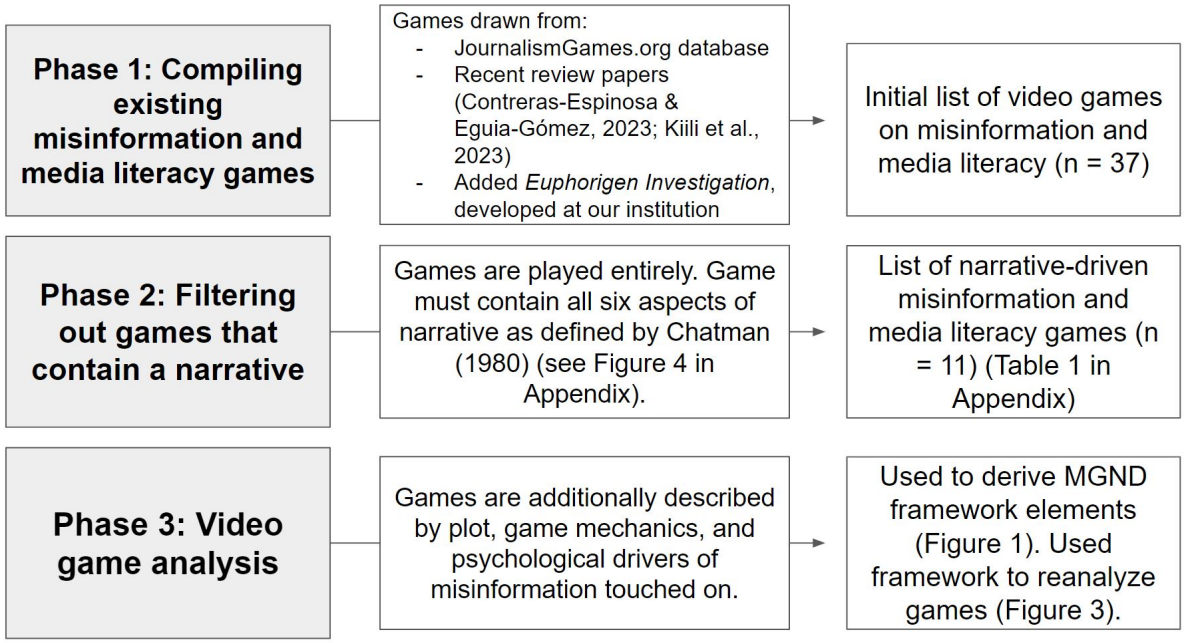

Figure 2. Process used to conduct our content analysis.

Content analysis

We compiled a list of 37 digital misinformation education games from recent review papers (Contreras-Espinosa & Eguia-Gomez, 2023; Kiili et al., 2023) and from the JournalismGames.org database (Grace & Huang, 2020). We focused on digital games as they are the dominant medium in this space. We excluded games no longer available online or not in English, and we additionally included *The Euphorigen*

Investigation, a recent game developed at our university. We identified 11 games that qualified as narrative-driven (i.e., games containing events, character(s), setting(s), structure, point of view, and time) according to Jackson et al.'s (2018) heuristic. The authors used a consensus model to agree upon the set of games, using the heuristic to make initial selections and discussing conflicts to agreement. The entire process is summarized in Figure 2. We identified and described different aspects of these games' narrative design, which consequently informed the design of the MGND framework. We then re-analyzed the games using the MGND framework, as presented in Figure 3.

Game	Educational Goal	Audience	Psychological drivers	Structure	Setting	Tone	Agency	Morality	Ending	Dynamics
Adventures of Literatus	(1) Literacy, (2) Epistemic vigilance	Age 13-18	Heuristics	Linear	Fantastical	Leans serious	None	Positive	Positive	Individual
The Republia Times	(1) Inoculate, (2) Biases	Grade 9-12	Social pressure	Branching	Leans fantastical	Leans serious	High	Morally gray	Variable	Individual
Breaking Harmony Square	(1) Inoculate, (2) Biases, (3) Not caring	General	Heuristics, Emotion	Linear	Leans realistic	Humorous	Limited	Villain	Negative	Individual
BBC iReporter	(1) Literacy, (2) Epistemic vigilance	Age 11-18	Heuristics	Linear	Realistic	Humorous	High	Positive	Positive	Individual
Cat Park	(1) Literacy, Inoculate (2) Biases, (3) Not caring	Age 15+	Social pressure, Emotion	Plot twist	Leans fantastical	Humorous	Limited	Positive	Positive	Individual
Julia: A Science Journey	(1) Literacy, (2) Epistemic vigilance, (4) Differing ways of knowing	Grade 9-12	Heuristics	Linear	Realistic	Leans serious	None	Positive	Positive	Individual
Headliner	(1) Inoculate, (2) Biases	Age 14+	Social pressure, Rabbit hole effect, Emotion	Branching	Leans fantastical	Leans serious	High	Morally gray	Variable	Individual
Headliner: NoviNews	(1) Inoculate, (2) Biases	Age 14+	Social pressure, Rabbit hole effect, Emotion	Branching	Leans fantastical	Leans serious	High	Morally gray	Variable	Individual
Floor 13: Deep State	(1) Inoculate, (2) Biases	Age 15+	Social pressure	Branching	Realistic	Serious	High	Villain	Variable	Individual
The Euphorigen Investigation	(1) Literacy, (2) Epistemic vigilance, Biases	General	Third person effect, Confirmation bias, Emotion	Plot twist	Leans realistic	Serious	None	Positive	Positive	Group
Escape the Fake	(1) Literacy, (2) Epistemic vigilance	Age 12-18	Heuristics	Linear	Leans fantastical	Serious	None	Positive	Positive	Group

Figure 3. The list of narrative-driven games from our content analysis, classified using the MGND framework. *"Audience," "Setting," and "Tone" exist on continuous scales, while the other seven elements can be classified discretely.*

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Ethics
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Data availability
Replication data is not available for this study.

Appendix A: List of games in content analysis

In our content analysis of existing misinformation education games, we identified the following 11 games as being narrative driven, and drew the conclusions presented in the Evidence section from the plots and narrative devices used in these games.

Table 1. *List of narrative-driven misinformation games identified in content analysis.*

Name	Type	Platform	Plot Summary
The Republia Times	Choice-based simulation	Browser	The player serves as the editor-in-chief of the state-controlled *Republia Times* and faces a dilemma as their family is held hostage by the government. The player must choose between following government directives or supporting a rebellion.
Breaking Harmony Square	Choice-based simulation	Browser	Players assume the role of chief disinformation officer, tasked with subverting the tranquil community's democratic values by employing the five steps of the election misinformation playbook.
Adventures of Literatus	Point-and-click adventure	Mobile	Prince Literatus is trying to rescue the beloved princess of his country, Veritas, from a villain named Manipulus. He must chase Manipulus through a web of conspiracies and fake news created to make the villain a profit.
BBC iReporter	Choice-based simulation	Browser	The player is a journalist in the BBC newsroom working to determine the validity of sources and information for the articles they must publish every day. Players have to make decisions under pressure as they get feedback from their news editor and colleagues.
Cat Park	Choice-based simulation	Browser	The player is manipulated into creating a conspiracy against a cat park that the city is building. It is revealed that this conspiracy was orchestrated by a billionaire to buy the park land cheaply. The player must try to undo their actions to mitigate the situation.
Julia: A Science Journey	Visual novel	PC	The story begins in 2020 as Julia, a typical teenager, is struck by the COVID-19 pandemic. She must correctly navigate information from her friends, family, and the internet.

Headliner	Choice-based simulation	PC	The player character is the headliner of a newspaper publication in Galixia. They must balance their wife's illness, their daughter's college tuition, and getting a promotion while running news stories that affect the events of their town.
Headliner: NoviNews	Choice-based simulation	PC	The player character works for the *NoviNews* newspaper and faces moral and ethical dilemmas as they decide which news articles to publish. Their choices impact the political landscape, public sentiment, and the fate of various characters in the game.
Floor 13: Deep State	Point-and-click visual novel	PC	The player is director general of an executive agency that conceals a secret police force. Answering only to the prime minister, the director general can use smear tactics, disinformation, and a variety of underhanded methods to keep the government popular with the people.
The Euphorigen Investigation	Digital escape room	Browser	Players are asked to investigate a supplement called Euphorigen and whether it is actually safe for consumption. After falling into a misinformation rabbit hole, the player shares a deepfake video with a large influencer that states the supplement is unsafe and this information spreads. However, the supplement is actually safe and effective, and the player then has to try and remedy the misinformation that they spread.
Escape the Fake	Augmented reality escape room	Mobile + browser	Users are contacted by a quantum reality hacker who guides them through a web of trivia questions, augmented reality puzzles, and clues to unmask what is “fake” and ultimately save us all from a dystopian future. Players must find clues and dismantle common misinformation tactics.

Appendix B: How games were selected for content analysis

From our initially compiled list of 37 games, we sought to determine which games were narrative centered. To do so, we used the heuristic described in Jackson et al. (2018), which specified that a narrative game must have all of the following:

- **Events:** Ordered plot points that drive the story from beginning to end.
- **Characters**: Figures within the story that the player or main character has interactions with.
- **Setting**: A clear location or framing within which the story is occurring.
- **Structure:** The story generally has a beginning, rising action, climax, and ending.
- **Point of view:** The story occurs from the viewpoint of a specific character, or multiple characters.
- **Time**: There is some sense of chronological order to the events of the story.

Figure 4 provides three examples of how we systematically went through the 37 initial games to determine if they were narrative centered.

Game	**Bad News Game**	**Cat Park**	**Newsfeed Defenders**
Events	Learning each manipulation technique drives the game forwards, similar to narrative events.	The player character goes on an investigation, talks to several characters, and make discoveries that drive the story forward.	New posts appear, but these do not drive the story forwards.
Characters	There are various characters that make posts the player character can interact with.	The player character interacts with several named, unique characters.	There are various characters that make posts the player character can interact with.
Setting	The game takes place on Twitter.	The game takes placed in an unnamed city.	The game takes place on an online platform, but it is unnamed and unclear.
Structure	There is no sense of narrative structure (beginning, rising action, climax, end).	The story has a clear beginning, rising action, climactic plot twist, and resolution.	There is no sense of narrative structure (beginning, rising action, climax, end).
Point of View	The player character is a fake news tycoon.	The player character is a newcomer to the city carrying out an investigation.	The identity of the player character is unclear.
Time	A sense of time passing can be perceived through the increase in follower count.	A sense of time can be perceived through the progression of story events.	A clock indicating some sense of time passing is provided as a game mechanic.
Does this game qualify as a narrative game?	No	Yes	No

Figure 4. Examples of using Chatman's (1980) definition of narrative to determine if a game was narrative centered.

Appendix C: Worked examples of applying the MGND framework to different design contexts

Scenario 1: Helping cancer patients combat nutrition-related misinformation.

Cancer patients and their caregivers increasingly use the internet to find specific health and lifestyle information but are often targeted by companies advertising unregulated and misleading nutrition content (Warner et al., 2022). The intention of the proposed game is to help patients understand the ways in which they may be targeted and the types of nutrition misinformation that they may be prone to falling for. The plot begins with the player getting hired by a prominent wellness company to join the marketing team. Their new supervisor has charged them with making their new diet program successful. The company's diet plan has already gained some public attention after several cancer patients who tried the diet reported feeling stronger and more energized. However, the player uncovers some questionable strategies the company is using to market the diet plan. They are determined to do the right thing, especially as their partner is a cancer patient herself. Their investigation leads them to uncover the truth and challenge their supervisor's misleading marketing strategies.

- **Educational goal:** This game serves goals 1 (promoting literacy) and 4 (debunking). As an inoculation mechanism, it warns players of potential harms and types of nutritional misinformation they might encounter. It could also emphasize authoritative sources and deconstruct false beliefs by prompting discussion of specific misinformation that is already prevalent among cancer patients, such as the false belief that natural supplements are harmless; in reality, such supplements can interfere with their treatment.
- **Intended audience**: This game is very specifically designed for cancer patients and their families. The player character has a spouse with cancer and is intended to elicit player identification amongst the target audience.
- **Psychological drivers**: Players will be forced to combat their heuristics with critical thinking by carefully considering the different information and individual context rather than accepting something as the definitive truth. In addition, the game and the debrief will prompt players to reflect on how emotions play a role in the way people process information—through the protagonist's perspective, they will feel the emotional connection with their in-game partner who is also battling cancer.
- **Narrative structure:** This narrative follows a linear plot, in which all players will experience the same narrative beats in order to challenge their supervisor, a key element of the story which represents the player taking action against the adopted misinformation.
- **Setting**: The game takes place in a realistic setting with fictional elements, namely the wellness company promoting a nutritional product. In this context, players should feel like their in-game experiences closely reflect real life.
- **Tone**: The narrative has a serious tone, given the audience (i.e., cancer patients or their family members who may be exposed to nutrition-related misinformation) and the health issues they are undergoing.
- **Player agency:** The game should be designed for high agency. Players should feel that they have the power to choose what is best for their bodies while being well informed.
- **Player morality**: The player character should have positive morality. We want the player to understand the questionable strategies for using inaccurate or misleading information in ads targeted at cancer patients, but not to agree with or support those strategies.

- **Ending**: The game should have a positive ending to leave the players with a hopeful mindset.
- **Player dynamics**: The game would benefit from being played as a group, so that patients can share their personal experiences with different nutrition-related misinformation and learn from each other. An online mode might be helpful to allow players to experience the game safely if they need to be in an isolated environment.

Scenario 2: Teaching college students about the harms of viral deepfakes.

Doctored images have been a primary source of misinformation since the popularization of photo editing technologies, and the recent rise of deepfakes has worsened the issue. Deepfakes refer to videos manipulated using artificial intelligence techniques and that have been used to commit serious cybercrimes (Kshetri, 2023). The goal of the proposed game is to help college students understand the occasionally disproportionate impact that their actions online can cause, even without explicitly malicious intent. The player character is a college student who has doctored an image of their friend, a star football player, committing a minor crime. While the player character never intended to harm their friend, the image is picked up and amplified by student influencers and the college editorial. A rival school creates deepfaked content which worsens the situation. This leads to serious rumors and accusations. The player character is then approached by a mysterious figure who offers them the chance to go back in time and fix the situation.

- **Educational goal:** This game serves goals 1 (promoting literacy), 2 (addressing cognitive bias), and 3 (teaching about the consequences of not caring enough about truth)—it exposes players to the harms of doctored or deepfaked media and raises awareness about how virality can harm a person. The aim is to inoculate players against misinformation, help them understand how biases can affect processing and sharing of misinformation, and caution about the consequences of not caring if the information being spread is misleading.
- **Intended audience**: This game is generally designed for high school and college students, the most frequent users of social media, who could contribute to accidental and harmful virality.
- **Psychological drivers**: The narrative is intended for the player to experience the third person effect, which demonstrates that anybody can play a significant role in spreading misinformation regardless of intent.
- **Narrative structure:** The time travel setting is well suited to a branching narrative, in which players can explore the various consequences of their actions and choose how to remediate them.
- **Setting**: This game has both realistic and fantastical elements. While the portrayal of the spread of misinformation is quite realistic, the element of time travel adds a fantastical layer to the narrative which has the potential to give it wider appeal and make it broadly applicable to different groups of school aged players.
- **Tone**: The narrative has both humorous and serious elements. The player character's intent is to prank their friend, but this devolves into more serious circumstances. The humorous elements may help engage high school and college students in the narrative.
- **Player agency:** To mimic the experience that players might have on social media, where the virality of user-generated content is often out of the user's control, players should be given limited agency.
- **Player morality**: The player character has positive morality. They are meant to feel guilty about the wrongdoing they unintentionally committed because they care about their friend, and they are provided with an opportunity to correct the situation.

- **Ending**: The ending should be positive to make the player aware that they can individually do something to stop the spread of misinformation. A negative ending could cause them to feel cynical.
- **Player dynamics**: The nature of the narrative, in which the player character alone is personally responsible for the plot events, makes the game better suited to be played individually.

Scenario 3: Teaching children about the rabbit hole effect.

Misinformation "rabbit holes" refer to networks of misinformation that can lead individuals deeper into a web of falsehoods and conspiracy theories. The rabbit hole effect is not only fueled by various cognitive biases, but also by algorithmic mechanisms and social dynamics. Individuals can fall into the rabbit hole through algorithmic recommender systems, such as those which underlie YouTube, or be directed to rabbit holes by social networks through email or social media (Tang et al., 2021). The goal of the proposed game is to provide young children who are at high risk of encountering dangerous and misleading content through YouTube's recommender systems (Papadamou, 2021) with the experience of navigating misinformation rabbit holes. The player character is a space cowboy traveling with their AI companion cat. They are looking for a mystical object called the Dragon Tear, rumored to be able to heal all illnesses, so that they can cure their friend who is sick with a deadly disease. They discover an abandoned spaceship located near the planet containing the Dragon Tear and are contacted by the ship's AI which warns them that the alien residents of the planet are aggressive and hostile to humans. The player character finds out that the captain of the spaceship has been cryogenically frozen, and the ship's AI claims that this was to protect him from the aliens. The player character is then given a choice to wake up the captain to get more information about the aliens (i.e., to be skeptical of the information about the aliens) or not to wake up the captain and take the Dragon Tear from the planet (i.e., to believe the information about the aliens).

- **Educational goal:** This is an intervention intended to strengthen the investigative and critical thinking skills players must use to navigate complicated online contexts while playing off of their cognitive biases, thus supporting goals 1 (promoting literacy) and 2 (addressing cognitive bias).
- **Intended audience**: This game is specifically designed for upper elementary and middle school children. The heroic, adventurous player character is intended to elicit wishful identification in players, who are expected to roleplay these characteristics through their in-game choices (Dominguez et al., 2016).
- **Psychological drivers**: The goal is to have the players reflect on the rabbit hole effect by mimicking the experience of falling into the constructed web of misinformation presented in the game. This also touches on the influence of emotions on how people engage with information—for example, in the debrief, they will discuss why they decided to trust the AI, captain, or aliens, likely based on the characters' appearances, rather than the logical evidence.
- **Narrative structure:** It is important to allow children to make important choices within the game world to stress their agency. The agency provided also raises awareness about their personal responsibility to process information and make informed choices based on their analysis. A branching narrative, in which players can reach drastically different outcomes through their choices, is well suited to this design intention.
- **Setting**: Designing for elementary and middle school youth calls for a fantastical setting, which is more likely to engage them in the learning objectives.
- **Tone**: While the setting and characters may have humorous elements, the consequences of their actions should be serious to stress the importance of correctly navigating the information landscape.

- **Player agency:** This game provides high agency to players. The choices they make in the game have a large impact on the information they receive from non-player characters and, therefore, can have a large impact on the outcome of the game.
- **Player morality**: The player character is morally grey. While they have good personal motivations, they may end up wreaking harm on an intelligent and friendly alien civilization depending on their choices.
- **Ending**: The game has variable endings determined by the player's choices. The player may choose to wake up the captain, learn that the aliens are friendly, and consequently receive the alien civilization's help with curing their friend. Alternatively, they may choose not to wake up the captain, take the Dragon Tear, and destroy the alien civilization as a result. Without the aliens' knowledge, the player is unable to use the Dragon Tear and cannot cure their sick friend.
- **Player dynamics**: The game could be designed as an individual experience, in which players' personal choices are highly emphasized through the outcomes of the game. It could also be played socially, with one player controlling the character but the decisions being made by a group. This would allow for a discussion about the choices made and reflection on the reasoning behind them.