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.