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Literacy at play: an analysis of media literacy games used to foster media literacy competencies

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Media literacy is considered one of the key competencies to acquire in the 21st century. With games being recognized as having a large potential to train and educate, a wide range of games focusing on media literacy related topics such as fake news games, digital privacy, personal media habits, and practical media skills have sprung up over the years. All claim to foster media literacy skills and competencies. This begs the question how these games generally frame and understand media literacy, what competencies and skills they actually focus on, and through which game design choices. This paper thus asks: how media literacy games are designed to foster media literacy? Taking the Dutch Media Literacy Competencies Model as a departure point, we answer this question using a thematic analysis of 100 media literacy games and formal analysis of a smaller heterogeneous sample consisting of 12 games. We present a series of key findings involving the prominent presence of certain topics and competencies in the dataset, as well as prevalent design choices, allowing for a discussion of the current landscape of literacy games and underlying competencies and future potential for development.

KEYWORDS

digital games, media literacy, digital literacy, literacy competencies, educational games

Introduction

Media literacy, understood as "the knowledge, skills and competencies that are required in order to use and interpret media" (Buckingham, 2006, p. 36) is considered one of the key competencies to acquire in the 21st century. This especially concerns the type of media literacy that aims to increase information and digital media skills (cf. Vuorikari et al., 2022). With fake news on the rise in our digital media landscape [being consumed more than real news, nowadays (Gartner, 2017)], media literacy offers resilience against the potential harmful effects of consuming fake news by giving us the ability to think critically and make balanced judgements about all the information we find and use. Because of this, scholars, educators and policymakers have stressed the importance of innovative media literacy initiatives, especially those tailored to young people's news consumption habits and those offered via their preferred media channels (Mihailidis, 2018).

Given the popularity of digital games amongst adolescents (Lee et al., 2018), a wide range of fake news games, digital privacy games, and games on personal media habits have sprung up over the years, all of which claim to foster media literacy. However, this broad and diversified list of games also begs the question how these games generally frame and

understand the matter of media literacy, what literacy competencies and skills they focus on, and through which game design choices literacy is fostered. These are important questions to answer since a potential selective focus on or framing of media literacy education in games could at best impact the way that educators and parents think about the scope and depth of literacy competencies which can be trained through games and thereby their usefulness, and at worst undermine broader media literacy development amongst adolescents.

A literature review (De la Hera et al., 2023) done as part of this research project shows there is currently a lack of research providing these insights into the landscape of media literacy games. Firstly, the academic study of media literacy games is usually approached from a quantitative perspective, focusing on the possible effects of these games (e.g., Rowe et al., 2021), or a a research through design perspective, offering insights into the design process of a single literacy game and evaluating its use (Yamin et al., 2021). Secondly, of the papers that do explore the characteristics (topics, mechanics, literacy competencies) of the games more qualitatively, most focus on single cases, and the ones that do analyze a broader selection of games tend to focus on subtopics of media literacy such as fake news (e.g., Clever et al., 2020), cybersecurity (e.g., Hwang and Helser, 2022) or computational thinking (e.g., Sun et al., 2021). Thirdly and finally, the papers that do discuss a broader selection of games, consist of either a literature review combining and reporting on previous studies on singular or more selective media literacy games (Torres Toukoumidis et al., 2021), or instead focus on only one element (e.g., "operating media") of a, more common, broader understanding of media literacy (e.g., Škripcová, 2022).[1]

The purpose of this paper is to fill this research gap by conducting a qualitative analysis of a broad selection of (self-described or clearly identifiable) media literacy games (rather than games focused on a more narrow topic or popular entertainment games), while adopting a broad and multi-faceted understanding of media literacy. This will help to (1) provide an overview of which media competencies have been covered by these existing media literacy games and (2) generate insights into the strategies used to foster these competencies through game design.

This paper therefore answers the following research question: *how are media literacy games designed to foster media literacy?* For the purpose of this research, we define "media literacy games" as games which either explicitly present themselves as seriousgames focusing on media literacy (within the game, through its website, or on the platform where it is acquired), or serious games which through their design are explicitly geared toward one or more of the main topics, skills or competencies associated with media literacy.[2] The term "serious game" here is defined as a game that has been designed for a reason other than just to entertain (Ferdig, 2016, p. 319). By focusing only on serious games here, we connect to a larger research field focusing on the use of games and gamification in non-entertainment settings to educate or change behavior (cf. Egenfeldt-Nielsen et al., 2020).

Given that this research is part of a larger research project focusing on the potential of media literacy games funded by the Dutch Research Council (NWO), our understanding of media literacy departs from the purposefully broad and multi-faceted Dutch Media Literacy Competency Model 2021 (Netwerk Mediawijsheid, 2020). This model, discussed in more detail below, identifies a total of eight media literacy competencies and ten areas affected by a person's media use. In this paper, we report on how media literacy is fostered in a sample of games from an extensive database of 100 games which was created specifically for this project. The procedure of database creation, sampling, and thematic analysis of the game's topics, mechanics, and the inherent competencies they aim to train will be discussed in the method section below.

Ultimately, the analysis presented in this paper is focused on inventorying best practices in using digital games to support media literacy skills. This research clarifies if, and if so, how the eight competencies of the media literacy model as created by the Dutch Media Literacy Network are fostered through these games. Additionally, we also highlight and critically assess persuasive strategies used in these games to foster media literacy, particularly through ludonarrative and procedural rhetorical strategies (Bogost, 2007; Gómez-García and de la Hera, 2022).

The outcome of this research can thus be considered an overview of common practices in literacy games design. It does not look at the potential of using games in an educational setting in general (cf. Squire, 2011; Gee, 2013) but more specifically focuses on how developers up until now have dealt with media literacy in these games. As such, what our research presents is a comprehensive overview of existing media literacy games specifically showing which topics are more prevalent as well as which competencies are over- and underrepresented in the main goals of these games. The thematic analysis additionally provides insights into the specific ways games link literacy topics and goals to specific game design choices. All of this will eventually highlight focus and gaps in current development of literacy games which can be used to further our insights into the use and usefulness of games in fostering media literacy. Apart from academic relevance, this research also has relevance for more applied purposes, as it allows developers to focus on those media literacy competencies which are currently underrepresented in the literacy games landscape.[3]

Defining media literacy

As pointed out in the introduction, media literacy has become a key concern in our contemporary society, as it promises to educate our children to become and remain active and

1 As we'll discuss below, "operating media" is only one out of eight competencies of our much broader understanding of media literacy which we derive from the Dutch Media Literacy Competency Model 2021 (Netwerk Mediawijsheid, 2020).

2 See below for a thorough discussion of the different skills, topics and competencies associated with media literacy.

3 This paper is part of three research studies within the larger project titled "DIGITAL LITERACY GAMES: Digital games designed to support digital literacy skills acquisition" funded by the Dutch Nationaal Regieorgaan Praktijkgericht Onderzoek SIA, part of the Dutch Research Council (NWO). The results of the other two studies focus on a large-scale literature review on existing research on the effects of literacy games (De la Hera et al., 2023), and the evaluation and validation of the effects of actual classroom use of a literacy game on primary education students (Kneer et al., in prep).

critical members of our increasingly mediatized society thereby fostering civic engagement and overall socio-cultural well-being. However, underneath this broadly agreed-upon potential benefit of increasing media literacy lies a more disparate understanding of the term with different interpretations emphasizing different skills and competencies.

Traditionally media literacy has been understood as the ability to read, watch, listen and understand the media (principally press, radio and television). The evolution of the media landscape linked to the introduction of digital technologies have implied a change of paradigm. Nowadays, media literacy is considered the critical understanding and active participation in the media (Buckingham, 2006).

Roughly speaking, we can identify a spectrum of media literacy understandings with one end focusing on skills related to mastery and the other end focusing (more) on critical, reflective competencies. On the skills end of the spectrum, as Martin (2006) points out, ICT-related literacy was for a long time considered to be about technical and other applied skills like operating devices and digital tools. This emphasis is also found by Voogt et al. (2019, p. 60), in their literature review on definitions of digital literacies. On the competency end of the spectrum, people like Buckingham argue that, while students obviously need to begin with a basic understanding of how to use contemporary media, "to stop there is to confine digital literacy to a form of instrumental or functional literacy" (2006, p. 267). Instead, he argues:

> [Students] also need to be able to evaluate and use information critically if they are to transform it into knowledge. This means asking questions about the sources of that information, the interests of its producers, and the ways in which it represents the world; and understanding how these technological developments are related to broader social, political and economic forces (Buckingham, 2006, p. 267).

Over the years, several attempts have been made to tease out and bring together these different dimensions of media literacy in models that are able to further inform policy and education, such as the Digital Citizenship Education Handbook by the Council of Europe (Richardson and Milovidov, 2019) or The Digital Citizenship Handbook for School Leaders in the United States (Ribble and Park, 2022).

For the purposes of this research project, we similarly opt for a broad and multi-dimensional approach to media literacy which combines a more practical skills-based understanding of media literacy (e.g., operating or creating with media) with a more critical evaluative understanding (e.g., reflecting on and understanding media). Such a broad understanding does not only do justice to the complexity of dealing with media in our current times, it also allows us to explore its different dimensions in the media literacy games under investigation. As we'll explain and reason below, we draw our understanding of media literacy specifically from the Dutch Media Literacy Competency Model (2020).

Media literacy in the Netherlands

Given the context of our project, we specifically turn to the situation in the Netherlands, which has seen several attempts at unraveling and standardizing media literacy to increase its role within educational programs in national policy (cf. Wiegman and Berkhout, 2019; Agirdag et al., 2020; Opree et al., 2021). The foundations for much of the thinking behind the current model (Netwerk Mediawijsheid, 2020) were laid in an influential policy paper on the topic by the Dutch Council for Culture ("Raad voor Cultuur"). In this paper, media literacy ("mediawijsheid" in Dutch) was defined as "the sum of knowledge, skills, and attitudes citizens need to consciously, critically, and actively find their way within a complex, ever-changing and fundamentally mediatized world" (Raad voor Cultuur, 2005, translation by authors). Media literacy here is meant to combine both the "functional" (i.e., "skills") and the "critical" (i.e., "competencies").

This definition of and increased attention for media literacy was pushed by an observed lack of literacy amongst children and a drive to elucidate what it is that these children should be learning in their daily interactions with media. As previous research has shown, Dutch children are less literate than expected (Dirkx et al., 2013; Nieuwelink, 2020), with one study showing that only 50% of 10-12 year old were digital literate at a level that could be expected of them (Netwerk Mediawijsheid, 2018). As such, digital literacy has become a key part within the new Dutch national educational policy plans titled Curriculum.nu (cf. Agirdag et al., 2020).

Within this national setting, the ongoing attention for increasing media literacy among young people formed the starting point for the creation of a media literacies competencies model created by the Dutch Media Literacy Network (i.e., Netwerk Mediawijsheid) in 2012. This network was established in 2008 as a program initiative by the Ministry of Education, Culture and Science in order to connect the many hundreds of non-profit and commercial organizations dedicated to media literacy. The version of the competencies model used within this study is the revised edition published in 2020. As is pointed out in the documentation of the model, the goal was to give substance to the aforementioned media literacy definition by the Dutch Council for Culture and to serve as a point of departure for setting up new activities, projects, and services by the network partners as well as research projects to study and monitor media literacy among various target groups (Netwerk Mediawijsheid, 2020, p. 11). This is why the current research project has adopted this model as a point of departure.

The media literacy competency model

The initial 2012 model was based on a research report by a project group consisting of Dutch cultural, educational, and research institutes (EYE Film Instituut, 2011) which provided the groundwork for the initial ten competencies, each further specified on five competence levels (Netwerk Mediawijsheid, 2012a,b). The newer 2021 version reduced the model into eight core competencies

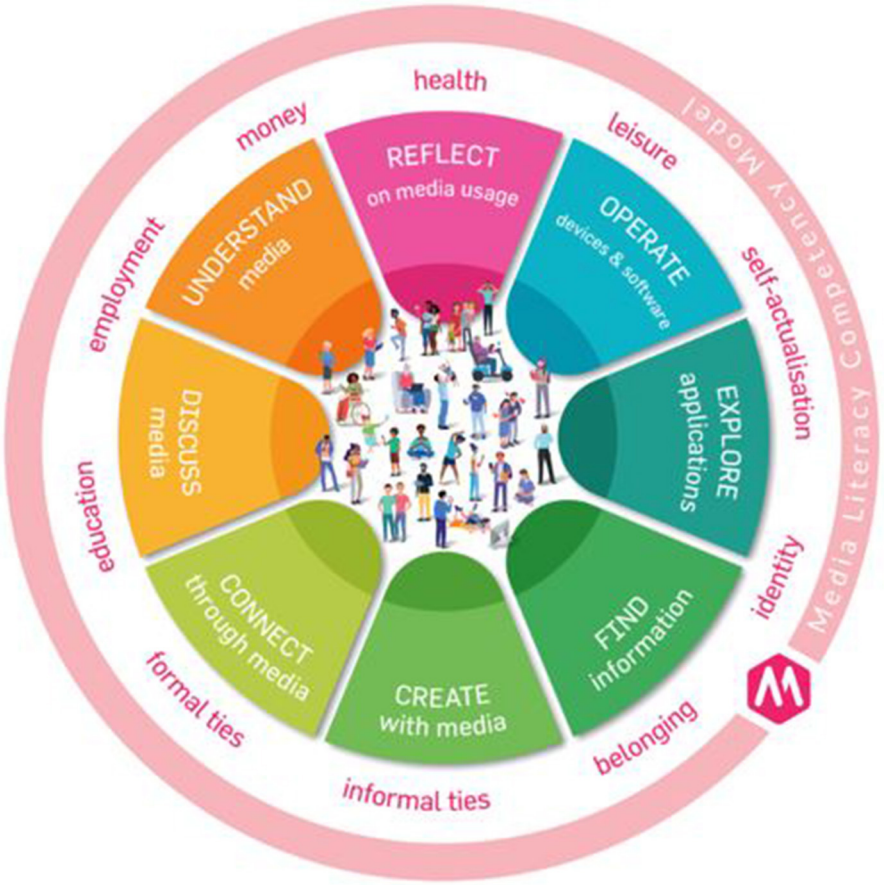

FIGURE 1
The Dutch media literacy competency model 2021 (English version, 2020).

explained through simple verbs: to operate, to explore, to find, to create, to connect, to discuss, to understand, and to reflect. In the substantive accountability for the model, it is made clear that two of these competencies (to explore and to discuss) are new to the model. Based on the work of Jenkins et al. (2005) and Coiro and Hobbs (2016), these additions focus on the more playful, experimental approach to media, as well as the fact that media literacy should not be seen as having one fixed outcome but rather should lead to the result of mutual and societal dialogue (Netwerk Mediawijsheid, 2021, p. 5). Whereas the 2012 model consisted of a more linear approach to media literacy (moving from the more passive to active and strategic competencies), the 2021 model is circular suggesting that competencies are of equal importance (see Figure 1).

The new version also includes an outer ring consisting of ten areas of media use, informed by Helsper et al. (2015) research on tangible outcomes of digital skills. The stated goal of the two rings is to present a dynamic model to help connect users (i.e., media literacy professionals) to connect media literacy competencies to achieving concrete goals in the economic, cultural, social or personal field (Netwerk Mediawijsheid, 2020). Given our focus on the games themselves and the way in which they foster media literacy, rather than the lived experience or potential impact of media literacy education through these games, we primarily focus on the competencies within the inner ring. We discuss these competencies in more detail below as part of the methodology section. First, we will connect media literacy to the potential of games to train literacy competencies.

Combining media literacy and ludoliteracy

Looking at games to educate young people about media literacy, and train them in its associated competencies is not far-fetched. Research on the use of games and play in educational settings in general has a long history starting well before Clark Abt coined the term "serious games" in his seminal 1970 book on the use of games for training and education (Abt, 1970). Here, however, we focus specifically on the use of games in relation to media literacy. Considering that the childhood process of learning takes place through playing, several studies for instance claim that the introduction of the use of technology at a young age can or even should be done through play (Andersen and Mirrels, 2014; Naranjo-Bock and Ito, 2017). More so, digital games are nowadays one of the preferred social leisure activities amongst children (Lee et al., 2018).

Gee theorized how the affordances and literacies of digital gameplay, the type of experiential learning provided by games, offer players a way to engage with topics and concepts that might not be easily accessible through conventional classroom approaches (2005). While traditional media use classical persuasion techniques based on verbal and visual rhetoric, the persuasive potential of digital games is unique due to their interactive nature (Deterding et al., 2011). Bogost has coined the unique persuasive potential of digital games as procedural rhetoric, this is, the reinforcement of argumentation through processes. Its advantage lies in the ability to show, in a practical way, how things work by playing with them rather than being told about them. Thus, thanks to user participation, more vivid experiences are raised than through traditional rhetorical formulas (Bogost, 2007, p. 45).

Previous studies have shown that media literacy games are effective in fostering media literacy skills such as multimodal literacy, critical literacy, digital literacy, information literacy, and game literacy, as well as interpersonal communication skills and experiential learning (Gambarato and Dabagian, 2016). Aside from teaching players about digital literacy through the content of game itself, research suggests that literacy games are also capable of stimulating the acquisition of literacy skills through the interaction with the game technology itself (Meyers et al., 2013; Romero et al., 2014; Gallardo-Echenique et al., 2015; Rakimahwati and Ardi, 2019). According to extensive meta-studies, games are successful at teaching skills through active engagement (Clark et al., 2016) and through inspiring and motivating affective connections to the content (Connolly et al., 2012).

It should not come as a surprise, however, that the effectiveness of the use of digital games for learning purposes depends on the way the game interacts with a learner's unique history and relationship to a domain, the game's own affordances, and the context of play (Squire and Jenkins, 2011). More so, from a media literacy perspective it should be noted that games are media themselves too. This means literacy *about* games, also known as *ludoliteracy* (Zagal, 2010), should play a part in this discussion. This becomes all the more relevant when taking into account the aforementioned pervasive nature of games in the lives of young people (Glas, 2017). In this research, we do not focus on serious games created to specifically enhance ludoliteracy. That does not mean understanding games and their design is not a useful skill seen from a larger media literacy perspective. Game scholar and designer Eric Zimmerman combines the approach of thinking about ludoliteracy and media literacy in general into what he calls "gaming literacy." For him gaming literacy is key in addressing the "new sorts of literacies that will become increasingly crucial for work, play, education, and citizenship in the coming century" (Zimmerman, 2009, p. 23–24). Games, he argues, present players with systems to experiment with, which helps to understand the underlying systems and structures of our contemporary society, and engage in social interaction (Zimmerman, 2009, 25–27). Finally, Zimmerman argues that through game design, games offer meaningful, interdisciplinary engagement with a certain topic, concluding that:

> Gaming literacy is certainly not the only way to understand the emerging literacy needs [...]. But games and game design are one promising approach, making use of a cultural form that is wildly popular and wildly varied, both incredibly ancient and strikingly contemporary (Zimmerman, 2009, 29).

The benefits of game design within an educational collaborative setting have been discussed elsewhere as well in relation to literacy-related skills (e.g., Kafai and Burke, 2015; Glas et al., 2021; Werning and van Vught, 2021). All the works mentioned above show the plurality of potential when using games and play to engage with media literacy within an educational setting. The question is, of course, to what degree this plurality is visible within the sample of media literacy games already published over the years. In the next sections, we will discuss the methodology used to investigate these games in relation to the Dutch Media Literacy Competencies Model.

Methodology

Research design

In order to analyze the use of digital games to foster media literacy, this study adopts a qualitative methodology. In concrete we have selected a deductive approach, choosing *thematic analysis* (Braun and Clarke, 2006) and *formal analysis* (Lankoski and Björk, 2015) as data analysis methods. The final database consisted of 100 media literacy games. As we discuss below, a subset of 56 games were played, with a selection of 12 titles receiving a more detailed analysis.

Sampling

A total of 100 media literacy games comprise the sample for this study, all published between 2008 and 2023 (see Annex I). The selection criteria were as follows: (1) a title should fit our working definition of a media literacy game, i.e., games explicitly presenting themselves as serious games focusing on media literacy, or serious games which through their design are explicitly geared toward one or more of the main topics, skills or competencies associated with media literacy; (2) a title should be published in English or Dutch or should be using no written or oral language; (3) while the dividing line between them can at times be difficult to assess, a title should be definable as a *game* rather than an example of gamification [i.e., where only certain game elements are added to an otherwise non-game environment (cf. Deterding et al., 2011; Egenfeldt-Nielsen et al., 2020)]; (4) a title should be (at least partially) digital. The above criteria led to the deliberate exclusion of games which focused on purely technical rather than reflective skills (like educational games about learning how to code) but also examples like quizzes, tests and other titles which could be considered gamified media rather than games. It also left out non-digital board and card games, as our main focus was on digital games.

The sampling strategy employed for this study was *comprehensive sampling* (Gray, 2004), this is, we examined each and every case we could find that matched the sampling criteria. With a lack of readily available databases to search through for these types of games, our database was created through a systematic online search for the use of media literacy associated terminology used by the game developers and/or publishers in the description of their games on the website where they are playable, or the platforms where they are to be downloaded (in the case of smartphone apps for instance). At first, general search terms were used: "literacy games"; "digital literacy games"; "media literacy games"; "games on media" as well as Dutch language varieties of these search terms. This mostly returned titles related to misinformation (more on which below in the findings). This meant that we adjusted and finetuned search terms in a dialectic between results and theory on media literacy (i.e., common topics, and terminology from the media competency model). Additionally we found a sizable amount of titles using a *snowball approach*. The use of often referenced literacy games as search terms would for instance lead to educational websites where such titles would be mentioned among other titles not in our database yet. Finally, welooked at the websites of developers or publishers already part of our database to see if they had produced other titles which would fit the criteria. We stopped our search as soon as these search approaches did not yield new titles anymore.

Data collection and data analysis

We used a combination of two data analysis methods for this study: *thematic analysis* (Braun and Clarke, 2006) and *formal analysis* (Lankoski and Björk, 2015). The first part of the study consisted of a *thematic analysis* (Braun and Clarke, 2006) of the 100 media literacy games that composed the sample. For this analysis we followed the four steps of thematic analysis as described by Braun and Clarke (2006) to report on the different media competencies that were mapped onto the games and how this was linked to the paratextual information provided by the designers.

The data collection process for this phase was done in four steps. **First**, we collected general information on the games composing the sample including: the game's title, the year it was published, the platforms it could be played on, the developer and publisher and the country of origin. Furthermore, we looked for basic information which was more specific to the educational context of the game (when we could find it), the potential presences of teacher guides, and/or other relevant information about the primary goal or context of games. **Second**, we tried to identify the general topicor topics of the games on the basis of the game's description and other paratextual information available (e.g., screenshots, videos, reviews). **Third**, we looked for trends and outliers in the information we had documented about the games (e.g., dominant topicsand/or genres, productive years, developers and/or countries). And **fourthly**, we collected extra data about how the different media literacy competencies were mapped onto the games through a *superficial play,* "where the analyst plays around with the game for a few minutes, merely to make a quick classification and get a "feel" for the game" (Aarseth, 2003, p. 6). Due to pragmatic reasons (high costs, lack of appropriate specialist hardware) and a desire to focus on games which would have the potential to reach a large and broad audience, this fourth step involved a decision to only focus on those games in our database which were freely and readily available either on the games' own websites or through app stores. This meant we played 56 out of 100 titles in the database.

A key part of the thematic analysis was the use of the terminology of the Dutch Media Competency Model 2021 (2020) as sensitizing concepts as part of step four. This meant that for the 56 titles we played as part of the analysis, we would look at if and how the eight competencies of this media literacy model are fostered through these games. Our reasoning for only doing this for the played games rather than the whole dataset is that we wanted to see if and how the competencies were actually conveyed through play beyond the promises made in the game descriptions. The eight competencies of the model are: *operate devices and software* (mostly related to practical skills), *explore applications* (having an open, investigative attitude toward soft- and hardware), *find information* (which also includes matters as storing, sharing, presenting information and being able to detect misinformation), *create with media* (which also includes being able to write elementary code), *connect through media* (related to meaningful, constructive social interaction with others), *discuss media* (related to the attitude to critically discuss media use in an open dialogue with others), *understand media* (which relates to understanding mediatization of society, the specific language of media, and the underlying business models), and *reflect on media usage* (related to attitude toward one's own and others' media use) (Netwerk Mediawijsheid, 2020, p. 3–5). For each title we played, we assessed which of the competencies were fostered, to create an overview of the most dominant media literacy competencies currently fostered through media literacy game design.

The second part of our analysis consisted of a close reading in the form of a *formal analysis* as described by Lankoski and Björk (2015) of a selection of 12 games. The purpose of this formal analysis was to conduct an in-depth analysis of this selection of games, to identifynarrative, stylistic and rule-based strategies used in the games to foster media literacy competencies. Using close reading was meant not to identify commonly employed design principles but instead to come to an understanding of exemplary *persuasive strategies* as described by De la Hera (2019), including ludo-narrative and *procedural rhetorical* (Bogost, 2007) strategies, employed to contextualize and teach media literacy competencies. Therefore, we aimed for a close reading of a heterogeneous selection of games which simultaneously mirrored the abundance in topicsof our database. The sampling strategy followed for the formal analysis was therefore purposeful sampling following the maximal variation approach (Flick, 2007). This means first grouped games with similarities in the topic covered and the competencies fostered, to later select the game that better represented each category in terms of quality and scope of fostered competencies.

A table with a full overview of all 56 game titles, the media literacy topic or topics as well as the associated media literacy competencies can be found in Figure 2. To provide an easier overview of topics and associated competencies, the table is ordered alphabetically by game topic rather than game title. The 12 case study games are highlighted in green. See Appendix 1 for a

	TITLE	Media literacy topics	Operrate devices & software	Explore applications	Find information	Create with media	Connect through media	Discuss media	Understand media	Reflect on media usage
1	Co-Co's AdverSmarts	Advertisement recognision, web literacy				V			V	V
2	Most Likely Machine	Algorithms				V			V	V
3	Bloxxgame	Blockchain	V	V						
4	Free Culture Game	Copyright							V	V
5	Media Literacy Escape Game	Digital vocabulary								
6	Galgje	Digital vocabulary								
7	Woordzoeker	Digital vocabulary								
8	Cyber Choices	Digital well-being							V	V
9	Eliza	Digital well-being							V	V
10	ACBC	Digital well-being							V	V
11	Digital Compass	Digital well-being					V			V
12	Media Matties	Digital well-being					V	V		
13	Gamer Girl	Digital well-being							V	V
14	Superbetter	Digital well-being								V
15	Mindlabs Energy Circuits	Energy circuits							V	
16	De Grootste Escaperoom	Environmentalism		V					V	
17	DigiKwis	Internet usage	V	V					V	
18	Cow Clicker	Microtransactions							V	V
19	Spot the Troll	Misinformation							V	V
20	ABC Fake News Game	Misinformation							V	V
21	Bad News	Misinformation							V	V
22	Bad News (Junior Edition)	Misinformation							V	V
23	Fake it to Make it	Misinformation							V	V
24	Fakey	Misinformation							V	V
25	Go Viral!	Misinformation							V	V
26	Harmony Square	Misinformation							V	V
27	Informable	Misinformation							V	V
28	Postfacto	Misinformation							V	V
29	The Fake News Game	Misinformation							V	V
30	The Republia Times	Misinformation							V	V
31	The Westport Independent	Misinformation							V	V
32	Troll Factory	Misinformation							V	V
33	BBC iReporter	Misinformation		V					V	V
34	Cranky Uncle	Misinformation			V				V	V
35	Facticious 2018	Misinformation			V				V	V
36	Facticious Pandemic	Misinformation			V				V	V
37	Newsfeed defenders	Misinformation			V				V	V
38	Escape Fake	Misinformation	V						V	V
39	Interland	Misinformation, Privacy, Digital well-being							V	V
40	MediaMasters	Misinformation, Privacy							V	
41	Mediamasters Themamissies	Misinformation, Privacy							V	
42	Datak	Privacy	V						V	V
43	Cyber X scape	Privacy							V	V
44	Beeld Kraken	Privacy		V	V				V	
45	Hack de Hacker	Privacy							V	V
46	Data Detox Game	Privacy							V	V
47	HackShield	Privacy							V	V
48	Help de FBI	Privacy							V	V
49	Click if You Agree	Privacy							V	V
50	Data Defenders	Privacy							V	V
51	Google Feud	Search engine		V	V				V	
52	A Google a day	Search engine		V	V				V	
53	Oculus Riftirement	Social acceptance		V						
54	Minecraft in later life	Technology acceptance		V						
55	ARe You Ready?	Virtual reality		V					V	V
56	The Wiki Game	Wikipedia		V	V					

FIGURE 2
All 56 games in the sample, organized by media literacy topic, each with their associated media literacy competencies.

ludography and short description of topic(s), goal(s), and main gameplay mechanics per game.

Findings

In this part of the article we want to explore key thematic findings of our analysis of the dataset as a whole, as well as the analysis of the sample games. We start with findings which sketch a broad sense of what media literacy games are about when looking at the results of the thematic analysis, to then move to observations which relate to the more specific gameplay mechanics we encountered in relation to media literacy competencies. Below, we grouped our findings into common topics and prevalent competencies, and finally discuss prominent related game design choices.

Distinguishing the most common topics

As said, we based our analysis of topics on how developers and publishers label games themselves. We did group games together if they would fall under the same larger socio-cultural phenomenon or issue. These could be considered umbrella topics, covering related topics under one header. When doing so, one of the first major finding was the large number of games we could label as misinformation games. As is visible within Figure 2, out of our entire sample, 20 games were dedicated fully to the topic of misinformation, with 3 containing misinformation as a key literacy topic next to other, often related topics as digital well-being and privacy.[4] No other topic was present in such numbers. The term "misinformation" describes a wide variety of related topics, ranging from fake news to the identification of reliable sources, and from dealing with arguments with strangers online to conspiracy theorists. In some games the player takes the role of the person responsible for the news (such as in *Data Defenders* or *Factitious*), in others, the player fights against fake news (such as in *Cranky Uncle* or *The Fake News Game*) and in some of them the player is the one spreading the fake news (like *Bad News*, *Harmony Square* or *Troll Factory*).

This abundance of misinformation games is perhaps not surprising. It appears that game developers are aware of current social and political upheaval about the influence of fake news and social media and incorporate these issues into their games as a way to appeal to players and attract attention (Quevedo-Redondo et al., 2022; Morejón Llamas, 2023). After analyzing the sample, it became clear that many game developers use terms such as "disinformation," "literacy" or "fake news" loosely, as a strategy to reach the desired audience. The large presence of these games in the dataset can be argued to say something about the societal need for such content, and the apparent reaction of developers and publishers to meet these needs.

It should be noted here, that the topicof these games does not necessarily say anything about the actual literacy *competencies* the games foster. Still, what we found is that the main gameplay mechanics of the games we labeled as misinformation games predominantly related to the competencies understand media and reflect on media usage. As can be seen in Figure 2, only four titles actually actively tried to engage players with the *find information* competency (such as *Newsfeed Defenders* and *Cranky Uncle*). One would expect games about misinformation to more proactively focus on information gathering, but only a handful of the group did so. We will further reflect on this below.

Beyond the games we could label as misinformation games, the most prominent other topics we found in the dataset were games we put under the umbrella topics of privacyand digital well-being. With these topics too, we saw such terms also being used in a broad sense to capture potential audiences of players. Privacy-related games for instance would aim to educate players about how to create better passwords (e.g., *Cyber x scape*); how to behave when talking to people online (e.g., *Interland*); what to do with sensitive information (e.g., *Data Defenders*); how to hack files or how to protect from file hacking (e.g., *Hackshield*); what cookies are and other autosave information is (e.g., *Click if You Agree*) and so on. No title would aim to cover all the aspects of digital privacy but rather focus on one such issue and, subsequently, also focus on only one or two associated competencies.

The same goes for the umbrella topic of digital well-being, under which we filed games focused on how to deal with cyberbullying (*ACBC*), how to respond to online sexism (*Gamer Girl*), how to overcome depression (*Superbetter*), and how to navigate the digital social world in high school (*Digital Compass*). Finally, games focusing on teaching players to use certain applications are worth mentioning here, as they share a common goal but often have very different topics. As operating or using applications or devices are already specific competencies (see competencies model) we did not group these under one overarching topic. This would create too much overlap between game topic and competency. Some of these games for instance focus on understanding how to work with certain soft- or hardware applications (as such strongly linked to the "explore applications" competency) by for instance helping players to use a search engine (*A Google a Day*, *Google Feud*) or a certain VR application (*Oculus Riftirement, ARe you ready?*).

Prevalent competencies

In this section, we explore our thematic findings related to the media literacy competencies the games aim to engage with or train. The prevalence with which certain competencies are incorporated in the media literacy games exemplifies which competencies the field of serious game development considers the most relevant, urgent or fashionable. Simultaneously, it can expose gaps in media literacy knowledge articulated in these games.

In our analysis of our data subset of 56 games, we mapped all competencies which the games explicitly or implicitly seemed to address, to all the titles. When organizing and visualizing those relationships in Figure 2, it becomes immediately clear that certain competencies (as described by the Dutch Media Literacy Competencies model) are covered by a significant amount of

4 Several games in our sample did not focus on just one topic but touched upon several. In our overview (see Appendix 2), the topic mentioned first was considered the dominant or most prevalent one.

games, while others were hardly present at all. Naturally, games can aim to cover several competencies.

The biggest thematic finding here was related to the competencies understand media (i.e., understanding mediatization of society, the specific language of media, and underlying business models), and reflect on media usage (i.e., attitude toward one's own and others' media use) (Netwerk Mediawijsheid, 2020, p. 3–5). In fact, as can be seen in Figure 2, in our sample of 56 games only 10 games did not incorporate the understand media competency, and only 16 did not incorporate reflect on media usage. In comparison, only 11 games incorporated the explore applications competency, and only 8 games incorporated the finding information competency. The other remaining competencies were represented even less within the sample games, with operate devices and software being incorporated in 4 games, create with media and connect through media both in merely 2 games, and the competency to discuss media in only 1 title.

This leads to some key observations. First, the majority of games thus focus on a reflective attitude. This attitude relates to how digital media work (*understand media*) and how one can or should see one's own role and actions within a media environment (*reflect on media usage*). The first can be considered a more passive attitude, the second adds a more strategic attitude focusing on media use and, potentially, changing such use. Some games in the sample add a more (inter)active dimension to these reflective attitudes by asking players to explore specific applications or by including active forms of information gathering (e.g., *Fake it to Make it, Go Viral, The Westport Independent*). As we will show in the game analysis below, many games however have a very specific argument they aim to make, and make this in a very specific way through the use of game design, leaving little room for additional player agency or creativity.

Interestingly enough, several games within the sample which highlighted the competencies of operating software and devices and explore applications did not include the more reflective competencies mentioned previously. They would mostly focus on explaining how certain technologies or applications work, and less so on what it would mean from a more critical or individual use perspective. An even smaller set of games in the sample did not incorporate any of the competencies as defined by the model in a meaningful enough manner. As can be seen in Figure 2, these games were grouped under the topic of digital vocabularies. The game Woordzoeker, for instance, is basically a simple word search puzzle using media terms. It is presented on its host website as a media literacy game, but provides no additional information about the meaning of the terms themselves. Especially these latter games can be considered good examples of titles only using media literacy as a selling point rather than engaging with literacy in a critical, reflective manner.

Another key observation can be made about the lack of games incorporating competencies related to the more participatorysocial literacy competencies connect through media and discuss media. One key reason for this, we argue, is that almost all of the games within the subset are single-player rather than multiplayer games.

It should be noted that many of the games in the sample were created to be used in an educational environment, where discussing and connecting through media can be achieved through social in-class interaction. Some games, like *Bad News* or *Digital Compass*, even include teacher guides for this very reason. As mentioned in the theoretical framework, the context of play matters for the effectiveness of educational games (Squire and Jenkins, 2011). As such, these competencies can be fostered by the game in an indirect fashion through the educational setting in which a game is played. If it was not an explicit part of the game itself, we did not take it into account in the analysis. What we can argue, however, is that games without the explicit inclusion of these competencies within their design will in all likelihood also not provide players with such competencies when they are not added in an educational social setting with teacher guidance.

A final, overarching observation about the competencies in the games is that the large majority of games focus on a single issue or topic, and connect this to a very particular competency or the aforementioned prevalent set of related competencies of *understand media* and *reflect on media usage*. As such, the large majority of games aims for specific purposes within the larger media literacy sphere, such as misinformation or digital safety, rather than media literacy in general. The perceived benefit is a clear and focused design and topic, but a drawback we envision is that most of the media literacy games we looked at fail to address the potential interdependence of media literacy competencies.

Recurrent game design choices in media literacy games

While the thematic analysis allowed us to make general observations about the competencies the games covered, without playing them, it was not possible to consider *how* these competencies were actually fostered through gameplay. As mentioned, as part of the final step of playing through the 56 games in the database we also paid attention to the ways in which literacy topics were connected to gameplay as well as aesthetic design choices.

As we explained in the methodology section, the games analyzed here are a heterogeneous (purposeful) sample of the larger set of games. The discussion of findings is exploratory rather than all-encompassing but nonetheless aimed at examining exemplary strategies we also witnessed in the larger set of media literacy games in the sample. The goal is to provide more detailed insights into what existing games are in terms of game design, which also allows for further reflection of what these types of games could be in terms of future development (which we will return to in the discussion).

What we found here is that games beyond the most simple applications of literacy into game form (like the word search puzzle game mentioned above) often use fictional game worlds as stand-ins for the real-world and its social-cultural issues. This is, of course, not uncommon, with educational games having mimicked entertainment games by offering fantastical setting to increase intrinsic motivations to play or to act as cultural models to interact with (cf. Egenfeldt-Nielsen et al., 2020, p. 258–261). The gameplay, i.e., the procedural model players follow to progress through a game, is embedded within such fictional worlds, but the design strategies for combining the two can differ significantly. As Bogost points out in his work, what he calls the "surface representation" of a game is not "mere dressing for the abstract rules" but ideally

	TITLE	Media literacy topics	Operrate devices & software	Explore applications	Find information	Create with media	Connect through media	Discuss media	Understand media	Reflect on media usage
1	ARe You Ready?	Virtual reality		V					V	V
2	Bad News	Misinformation							V	V
3	BBC iReporter	Misinformation		V					V	V
4	Cranky Uncle	Misinformation			V				V	V
5	De Grootste Escaperoom	Environmentalism		V					V	
6	Digital Compass	Digital well-being					V			V
7	Fake it to Make it	Misinformation							V	V
8	Gamer Girl	Digital well-being							V	V
9	Harmony Square	Misinformation							V	V
10	Interland	Misinformation, Privacy, Digital well-being							V	V
11	Newsfeed defenders	Misinformation			V				V	V
12	Troll Factory	Misinformation							V	V

FIGURE 3
The case study games, organized by media literacy topic, each with their associated media literacy competencies.

works together in unison with the rules (2007, 242). Games, he argues, can offer a medium-specific form of rhetoric he calls procedural rhetoric which mounts or expresses arguments through rules and procedures. Such "procedural representation," he points out, can be "deliberately chosen for its applicability to the games' respective topics" (2007). Gameplay, then can move from merely being associated with a literacy topicor competency, to actually demonstrating it in the process of play. In our formal analysis, we specifically looked for this interplay between rules and fiction in the 12 games we analyzed more in-depth. See Figure 3 for an overview of the specific titles, their topics, and associated competencies.

The game *Interland*, for instance, sells itself as a game about online safety and citizenship. The game presents itself as an adventure-like game with a fantasy world where players need to shield a castle from killer robots by building the castle walls higher and stronger. In order to do so, players need to select the strongest password out of a list, upgrading the castle walls every time the player selects the right choice (see Figure 4). Here, building strong castles in the fictional game world stands for creating good online safety measures for online spaces in the real world. It does, however, require an extra step of understanding the link between gameplay actions (choosing passwords to build walls) and real-life application of such actions (creating good passwords to protect oneself online). The game world's aesthetics and gameplay are geared toward creating and maintaining an engaging experience, with the real-life competencies fostered being addressed indirectly. From a procedural rhetoric perspective, the idea that the process of building stronger walls is akin to creating stronger passwords is nonetheless sufficiently clear.

We did, however, see games where the design choices to engage players through an engaging gameplay experience were not as easy to connect to the media literacy competency the games were aiming for. The browser-based *Free Culture Game* for instance aims to make players understand contemporary copyrights. The simple game is played using a mouse, where you have to keep certain balls from getting sucked up by a little machine on the side using the cursor. In terms of procedural rhetoric, this gameplay however has little to do with the copyright industry. Here, rules and fiction are not aligned in terms of meaningful interaction (see Figure 5). Instead, learning about copyright occurs almost entirely outside of the context of the actual gameplay. After starting the game it is explained that the balls are Intellectual Property created by individuals and the machine stands for the corporations which take credit for this IP. Without this contextual knowledge, the educational goals would remain unclear during actual gameplay. Consequently, recognizing IP and its various corporate appropriations would still be incredibly difficult after playing the game.

The notion of procedural rhetoric is a relevant starting point to understand how games aim to foster media literacy, but we did not consider it as the *only* way games can transfer meaning and engage with literacy competencies. As De la Hera points out: "procedural rhetoric should not be seen as [...] the unique persuasive domain available within digital games but as a strategic option that could be useful for some purposes, but not for others, and like other persuasive forms, it may hold a potential that is not always fully realized" (De la Hera, 2019, p. 196). Hence, we also focused on other design strategies involving different rhetorical strategies, such as specific forms of interactive storytelling.

When playing through and analyzing the games' core features from this perspective, what was immediately striking is that the

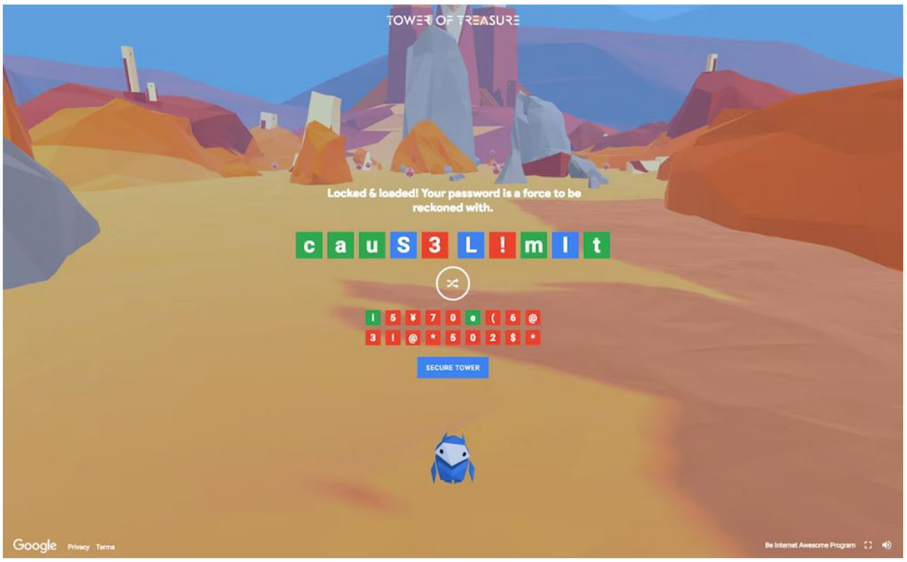

FIGURE 4
Playing with passwords in Interland.

specific topical focus was often aligned with a very linear narrative path, limiting agency for players to deviate or experiment with other options. The games are for instance divided into chapters, questions, or a timeline, which dictate the progression of the story, limiting the player's ability to alternate from the main narrative (see Figure 6 for example). This design allows for a focused educational experience but sacrifices the open-ended and non-linear characteristics associated with more experiential, discovery-based educational games.

With such a linear path to take, and recognizing that the large majority of games focus on a single-player experience, we started looking at how learning is linked to playing (and thus experimenting) with a certain identity which the game's fiction asks players to fulfill. The link between identity play and learning has long been described as a key intrinsic quality of games (cf. Gee, 2003), further underscoring the relevance of this analytical focus. Three recurrent player roles appear in the 12 games we analyzed: Fake content creator (e.g., *Harmony Square*, *Troll Factory*, *Fake it to Make it*, *Bad News*), fact-checkers or media professionals (e.g., *BBC iReporter*, *Newsfeed Defenders*), and citizens exposed to (or trying to resist) disinformation (e.g., *Interland*, *Cranky Uncle* or *Factitious*). Each role highlights different competencies from the Dutch Media Literacy Competencies Model, establishing different viewpoints and connecting up to different game mechanics.

Games where players assume the role of a creator of fake content portray the motivations of this activity that range from pure malice ("From fake news to chaos! How bad are you?," from *Bad News*) to more pragmatic motives ("You will be making money by creating news sites and profit from people viewing and clicking on ads on your site [...] We won't worry too much about sticking to the truth. Fake News takes less time to create, and it often spreads better than real news," from *Fake it to Make it*). In these games, credibility is a performance meter for the player, generally tied with followers (or another kind of popularity) or expenses (or another way to present economic benefit). Here, the game's scoring mechanics complement the narrative of these games, tying player success to the creation of more effective misinformation. Consequently, players do not only get to explore the consequences of spreading misinformation and how it can impact society and individuals, they also gain insights into the social, technical and economic mechanisms that help to afford the spread of this misinformation.

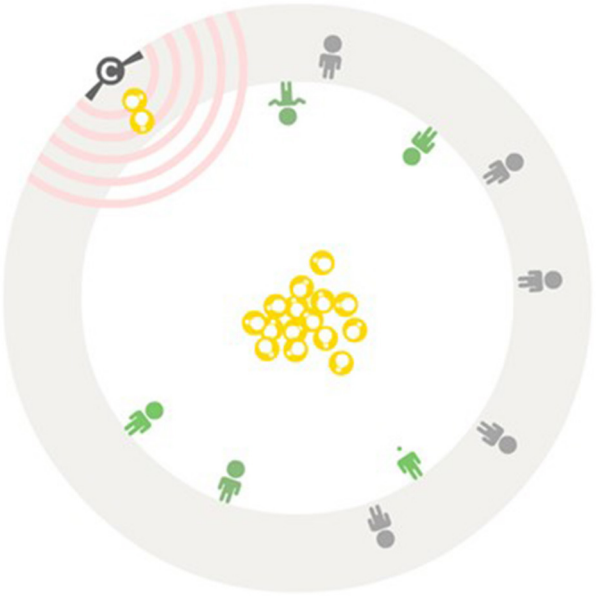

FIGURE 5
Gameplay free culture game.

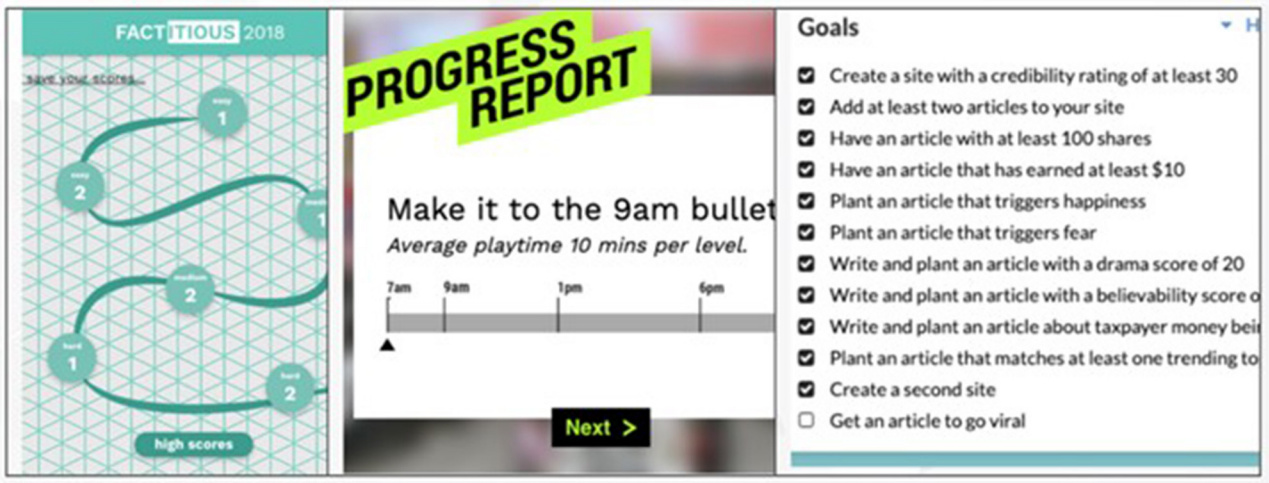

FIGURE 6
Game or goal structure on factitious **(left)**, iReporter **(middle)**, and fake it to make it **(right)**.

One relevant game in this sense is *Harmony Square* where tactics and manipulation techniques to mislead people are exposed in the player's role of "Chief Disinformation Officer" and play four chapters. Each one is dedicated to one polarization strategy: "trolling," "emotion," "amplification," and "escalation." other games use this content strategy as well. *Cranky Uncle, for example,* divides the game into techniques to deny science like fake experts, logical fallacies, impossible expectations, cherry picking and conspiracy theories. In these games, promoting digital literacy and critical thinking is thus done by reverse engineering disinformation processes. The use of these games raises ethical and deontological issues about the role of digital games as a form of discourse. As Amanda Warner, designer of *Fake it to Make it*, puts it when acknowledging the ethics around her game:

> "the process of creating fake news is already well documented online. If someone wants to make a fake news site, they already have access to the information they need. However, I acknowledge that there is a difference between information and inspiration. It's possible that this game could inspire someone to make fake news, but I'm willing to take the risk, because I think the potential for positive change in players is worth it" (Warner, 2017).

At the other end of the spectrum, games in which players must verify information are divided into two broad groups depending on the player's role. The first one, where the player is a fact-checker or journalist, advocates the *reflect on the media usage* and *understand media* competencies of the media literacy model. For example, the game *BBC iReporter* emphasizes the player's role as a BBC journalist, which is to cover a breaking news story and publish the story to a BBC live site. This purpose is integrated into the performance meters of the games, where the story must balance accuracy, impact and speed. Similarly, *Newsfeed Defenders* employs accuracy, transparency, trustworthiness, impartiality and focus as game meters (see Figure 7). They are relevant examples of how games can quantify some of the traits of the competency model. For example, players of *iReporter* have the chance to publish breaking news fast or verify some relevant issues about it. When the player chooses to publish fast without verification, the speed meter will rise, and the editor will be pleased as long as the information is right. Still, there is a greater risk of spreading misinformation which will make the accuracy and impact meters decrease. Sometimes, the editor scolds the player if the information is factually wrong. The additional content and teacher's guide of *iReporter* published on the BBC site[5] further elaborate on the perverse incentives at play in the mechanisms of the news publishing industry thereby offering further reflections on how to deal with sources in media usage and the process of verification by media outlets.

A different view is developed in games where the players are just citizens trying to distinguish correct from incorrect information. The most relevant game in this group is *Factitious* (in its different editions), in which the player must identify real articles and fake articles.

In trying to achieve this goal, players acquire skills that will help them identify fake news in the real world. While the game does not explain how scoring is going to be determined until the end (see Figure 8), the game's procedural rhetoric implicitly enforces a specific type of player behavior because not only are the correct answers rewarded, but finding the signals that identify fake news and the speed with which this is done are also encouraged. Thus, it can be seen that the design of the game or, more precisely, the way in which the player is rewarded or punished, shapes the literacy proposition in which players participate by accepting the rules.

In many of the games discussed above, various forms of rhetoric are in place. However, in games which engage the player in more long-term, strategic planning (as opposed to more short-term

5 Information available at: https://www.bbc.co.uk/teach/young-reporter/ireporter-guidance-for-teachers/zbb3hcw.

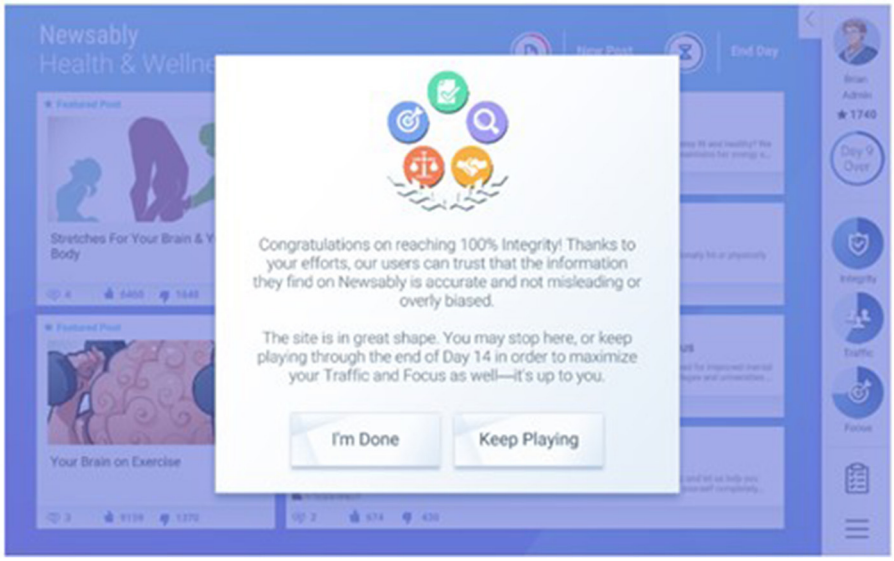

FIGURE 7
Newsfeed defender congratulates player for reaching 100% integrity.

Right reply: +40 points each
Wrong reply: -10 points each
Fast reply: up to 7 points
Slow play: down to -5 points
Show Source button: +2 points
Reading article: +1 point

FIGURE 8
How does factitious work? Source: factitious.

tactical decisions) we see that the potential for procedural rhetoric takes a backseat to more traditional forms of visual and verbal rhetoric. This makes sense because in these games, the positive and negative feedback loops are delayed which leaves the game to rely on other strategies to inform the player of appropriate play behavior. While this is not necessarily a problem in itself (visual and verbal rhetoric can be highly effective in games), we found that in some of our analyzed cases the lack of/limited procedural rhetoric was tied to a more obscure or even convoluted learning objective. For example, *Fake it to Make it* requires a greater combination and interpretation of elements to realize the consequences of the player's choices (strategic rather than tactical). The difficulty in determining the scope of the actions therefore affects the feedback the game offers in the long term and distinguishes it from the other games that propose it in a more immediate way. Therefore, the possible scope must be limited, because the effectiveness of serious games is based on the certainty that the player recognizes the game's intentions. In short, the feature that distinguishes and enhances these messages—their playful and interactive nature—sometimes becomes their main obstacle by obscuring the literacy purpose behind them.

Discussion and conclusion

Our research tries to offer an answer to the question *how media literacy games are designed to foster media literacy?* The results of our thematic and formal analysis show that media literacy games include a range of mechanics and narratives to foster different digital information literacy competencies as outlined by the Dutch Media Competency Model, 2021. However, as we've shown, the eight competencies of the model appear with different intensities. The prominent presence of specific topics and competencies in the dataset and the use of (seemingly more and less effective) prevalent design choices allow for a discussion about the current landscape of literacy games.

Firstly, when categorizing our dataset according to the topics or labels that the makers themselves have attributed to their games, we found a clear overrepresentation of so-called misinformation games. This suggests that socio-cultural concerns about fake news can be seen as a strong influence on media literacy development and publishing strategies. We can hypothesize here that specific societal concerns might be considered a key reason for developing games with specific literacy topics and directly related competencies, rather than developing literacy games about the more general need for increasing media literacy aiming to foster a broad set of competencies (development costs naturally play a role here too). Interestingly (and unexpectedly), this strong focus on misinformation does not translate to a focus on the media literacy competency of information gathering.

Here we identify a few clear gaps in the current landscape of media literacy games. The selective focus on misinformation has so far resulted in an underrepresentation of various other topics that also fall under the umbrella term of media literacy (e.g., cybersecurity, privacy, cyberbullying), thereby narrowing the understanding of media literacy and ignoring players the ability to acquire a broader set of media literacy skills and

competencies. Also, the mismatch between misinformation games and the competency of information gathering, seems problematic since it leaves players without an essential skill to deal with misinformation online.

Secondly, our findings suggest that the most dominant competencies in media literacy game design are those related to *understand media*, and *reflect on media use*. These highly reflective competencies were also most visible within the dominant topicof misinformation. While we have seen media literacy games focusing on practical skills (operating devices and software) and some even on having an open, investigative attitude toward software and hardware (exploring applications), we rarely identified a combination of the more practical and reflective competencies.

This separation of the development of more practical skills and the development of a reflective attitude clashes with the more holistic multi-dimensional understanding of media literacy that has now become widely accepted. As we noted above, while discussing the difference between an earlier version of the Dutch Media Competency Model and the current version, acquiring media literacy is not a linear process that runs from the more practical skills of operation to the more reflective understanding of the role of media in our society. Instead, all competencies in the model are created equal and work together in the development of media literacy. Consequently, games that only focus on a single (or a few) competencies fail to address how these competencies are more interdependent, potentially installing a highly selective type of media literacy in the player.

As highlighted in our analysis of competencies, what we also found missing were media literacy games focusing on the more participatory, creative or socially oriented competencies. We have related this to the fact that many games are single-player game experiences and offer highly linear forms of progression, leaving little agency to the player to deviate or experiment. Within a classroom setting, this means the games require an instructor to transcend the sometimes singular message or logic of the game and discuss the outcome as well as potential different interpretations among students. This could also help students understand and discuss the ethical dimensions behind reverse engineered forms of misinformation production as discussed above.

Thirdly and finally, our formal analysis yielded insights into best practices in the landscape of media literacy games. We found how the more compelling and informative games managed to translate the pursued media literacy competency and/or skill into a clearly connected game setting (while the less successful games leave a gap between the simulated competency and the real world competency). We also found how the more informative games made efficient use of procedural rhetorical strategies (next to other rhetorical strategies) to push the player toward appropriate in-game behavior, which suggests that especially games with a more immediate positive and negative feedback loop are suitable for the education of media literacy skills (as opposed to games that have the player make long term strategic decisions which rely more on other rhetorical strategies to educate the player). Finally, we found how designers used interesting narrative strategies to offer players different identities with different connections to the media literacy topic at hand. Here it seems that especially the medium of games allows players to step into the shoes of someone spreading misinformation online, providing interesting insights into the social, technical and economic motivations accompanying the initiation and spread of fake news.

Ultimately, this research reveals that media literacy games tend to focus on a limited set of media literacy topics and competencies (while being more varied in the design strategies employed to foster these competencies. While this focus on singular topics and specific competencies might make sense from a developer's perspective as it is directly related to socio-cultural concerns like misinformation or cybersecurity, it still fails to address the interdependence of media literacy competencies. In that regard, when looking at the Dutch Media Competency Model we see significant gaps in the overall media literacy topicsand competencies addressed through these games. This is important to recognize since the focus of media literacy games eventually impacts what and how players learn from them. As such, we argue that an inventory of media literacy games like the one we offer here, should always precede any studies into the experience and effects of these games since their characteristics strongly determine the possible efficacy of the games and thereby the outcome of these player studies. Finally, our findings also offer suggestions for game designers who, we hope, may now wish to address media literacy more generally instead of focusing on one of many individual phenomena usually associated with it.

Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Author contributions

TF and SG-G performed the initial analysis of games and contributed with first versions of the analytical sections of the manuscript which were further edited by RG. The sections of the manuscript related to theory and method were written by RG, TD, and JV. All authors contributed to the conception and design of the study, contributed to the submitted and revised manuscript, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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