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Literacies Against Fake News

Examining the Role of Data Literacy and Critical Media Literacy to Counteract Disinformation

Anna Soßdorf¹ , Carolin Stein¹ , Isabel Bezzaoui¹ , and Jonas Fegert¹ 

¹ FZI Research Center for Information Technology

Abstract

This article is guided by the question of what digital competencies are needed to deal with disinformation strategies in social media and how these competencies can be embedded in the discourse on (media) pedagogy. It considers this question from the perspective of the digital condition and addresses the current competency debate by proposing a synergetic linkage of critical media competencies and data competencies. On this basis, it explores the relationship between learning opportunities, digital infrastructures, and the resilience of our democracies. The article concludes by discussing our “Synergistic Literacy Model Against Disinformation” in terms of its advantages and relevance for future literacy concepts, solutions to broader societal problems, and the resilience of democracies.

Kompetenzen gegen Fake News. Untersuchung der Rolle von Datenkompetenz und kritischer Medienkompetenz im Kampf gegen Desinformation

Zusammenfassung

Der Aufbau des Artikels gliedert sich in fünf Teile und wird von der Frage geleitet, welche digitalen Kompetenzen im Umgang mit Desinformationsstrategien in sozialen Medien benötigt werden und wie diese Überlegungen darüber hinaus in den (medien)pädagogischen Diskurs eingebettet werden können. Dazu wird das Thema aus der Perspektive der Kultur der Digitalität betrachtet (2). Auf dieser Grundlage wird die aktuelle Kompetenzdebatte beleuchtet (3) und eine synergetische Verknüpfung von kritischen Medienkompetenzen und Datenkompetenzen vorgeschlagen (4). Anschliessend wird der Zusammenhang zwischen Lernangeboten, digitalen Infrastrukturen und der Resilienz unserer Demokratien aufgezeigt (5). In einem abschliessenden Abschnitt (6) wird unser entwickeltes «Synergistic Literacy Model against Disinformation» im Hinblick auf seinen Beitrag und seine Relevanz für zukünftige Kompetenzkonzepte, gesamtgesellschaftliche Herausforderungen und die Widerstandsfähigkeit von Demokratien diskutiert.



1. Introduction

The “digital condition” (Stalder 2018) places contemporary societies and individuals in a tension between the community-creating potential of the Internet and the risks social media poses to democracy. Digital platforms have become a primary forum for promoters of far-right ideologies and disinformation: Nowhere is it easier for them to reach their own followers as well as a broader audience. Their goal is to directly link their racist and anti-democratic messages with current sociopolitical discourses and lifeworlds (Glaser et al. 2017; Liang and Cross 2020). And by using the Internet, they meet the younger generation where they are. Although portraying their platforms as a kind of youth movement in which patriotically minded people spontaneously meet and exchange ideas, these right-wing ideologues are in reality employing a strategic concept for the ideological seizure of power in the social sphere. Right-wing extremists have been using the Internet and especially community organizing platforms for propaganda for some time, often disguised by sub-cultural elements ranging from music and games to vegan cooking. In this sense, they are active users, interpreters, and influencers who contribute to the digital condition. They capture attention and establish rapport before introducing their extremist ideas. This occurs through ideologically driven texts, links to niche communities, and promotion of events by radical organizations (Glaser et al. 2017). At the core of right-wing radicalization, however, is disinformation and propaganda (Lewandowsky and Yesilada 2021). As these groups use subtle exposure to their ideas through memes and disinformation to shape discussions (Liang and Cross 2020), individuals need special literacy skills to navigate the digital space and avoid falling victim to strategic disinformation and propaganda.

To address the challenges of dealing with disinformation in social media, this paper aims to show how two important competencies could be fostered to counter deceptive information. We examine a distinct set of competencies, beginning with a comprehensive understanding of media competencies (Soßdorf 2023; Trültzsch-Wijnen 2020). We focus first on critical media literacy, which enables a critical and reflective approach to structures, processes, and content in social media (Allen et al. 2022). Second, we focus on data literacy, which we define as the ability to understand how data and numbers are represented as well as a capacity for data-driven autonomy of action in dealing with disinformation in a competent way.

The article elaborates how these two literacies can be interwoven in a three-step process of awareness, reflection, and empowerment (Schmitt et al. 2018), and how their interrelation can be further developed into a model to create synergies empowering people to stand up against disinformation. In our Synergistic Literacy Model Against Disinformation, we argue that the individual literacies together contribute to the shaping of a comprehensive empowerment for living in a digitally driven culture by using media responsibly, critically examining media forms,

exploring media effects, and finally deconstructing alternative media (Kellner and Share 2005). In the long run, to combat online disinformation, an examination of the interplay of media and data literacy competencies is crucial for educators, learners, and developers of media tools. We argue in a broader sense that such emerging sets of competencies – if they are encouraged by a digital infrastructure offering learning opportunities – facilitate participation in modern society (Marten 2010). Ultimately, they may stabilize democracy and thus contribute not only to digital literacy in general but also to civic literacy and participatory citizenship.

2. Theoretical Background on the Challenges of the Digital Condition

In the digital condition, the “multiplication of cultural possibilities” (Stalder 2016, 10) becomes permanent and maintains a constant presence in our everyday lives comprised of three central dimensions: referentiality, communality, and algorithmicity. Whereas referentiality encompasses the infrastructure and social action on the Internet in which actors access, refer to, modify, remix, and create new content from existing digital products to (co-)shape cultural meaning, communality refers to collaboratively created content. Finally, algorithmicity involves the digital landscape in which automated decision-making processes reduce and shape the information overflow. This approach facilitates the extraction of information from the expanding pool of data available to individuals, subsequently serving as a foundation for both individual and collaborative actions. On the one hand, these ideas of a constantly present digital ecosystem offer numerous opportunities for community engagement using digital tools and platforms (Kaplan and Mazurek 2018). On the other hand, precisely these community-building tools are used by different audiences to spread and amplify populism and disinformation and thereby foster societal polarization (Glaser et al. 2017). This raises two major challenges requiring society to examine different concepts of digital competence.

The first challenge is that several peculiarities of social media, such as its basic modes of representation and interaction, promote certain developments in the course of discussions. Youth-oriented approaches have gained particular momentum through the stylistic tools of the social web. Multimedia forms of presentation, emotionalization, and sarcasm are employed by right-wing extremists, among others, to ensure rapid dissemination of deceptive content. Hostile attitudes toward marginalized groups are also incited through targeted disinformation that spreads quickly on the Internet. Disinformation is defined as false information, spread with the intention to deceive (European Commission 2018). Under the guise of serious reporting, right-wing extremists publish reports that are either completely invented or based on news from reliable media outlets but distorted by racist and anti-democratic messaging (Glaser et al. 2017). The origins of these articles is usually difficult

or impossible to trace, as the authors rely on inconsistencies being lost in the flood of information and statements not being checked for their truthfulness (Conway et al. 2019). In this context, being able to distinguish facts from fake news requires a developed and specific set of competencies as well as critical thinking (Bezzaoui et al. 2022; Chu and Lee 2014). Guess et al. (2020) demonstrated that improved media literacy can, for example, assist individuals in more precisely assessing the authenticity of online content. The results of their study indicate that the absence of sufficient critical media literacy plays a significant role in individuals' susceptibility to disinformation.

A second challenge is that the digitization of society goes hand in hand with increasing datafication (Schüller et al. 2019). Technological advances enable larger amounts of data to be collected and stored (Clarke 2016; Twidale et al. 2013) just as new methods of data and information processing and retrieval are emerging (Hambarde and Proenca 2023). Although these developments allow users to make powerful claims and inferences, they also fuel inequality and exploitation. Data ownership and literacy skills restrict who can use data to their advantage (D'Ignazio 2022). Increasing efforts to publish data in publicly accessible portals is not sufficient to ensure the usability of the data by the lay citizen (Simonofski et al. 2022; Twidale et al. 2013). In the absence of the necessary knowledge and skills, the mere publication of decontextualized data can contribute to the propagation of fallacies. Simultaneously, data products increasingly find their way into the media, where they are expressed, contextualized, and interpreted by authors (Schüller et al. 2019). As such, critical engagement with articles published in the media frequently depends on the recipient's ability to extract and evaluate underlying data (Debruyne et al. 2021; Schüller et al. 2019), just as searching for, selecting, evaluating, and interpreting essential information becomes more difficult (Mahyoob et al. 2020; Shu et al. 2020; Verma et al. 2021).

Based on this theoretical background and the challenges presented above, different literacy concepts will be discussed in the following to lay out the argumentation for our new “Synergistic Literacy Model Against Disinformation”.

3. Countering Right-Wing Extremist Disinformation Requires Literacies

Media competencies and literacies, both in general terms and in regard to specific competencies, have been a broad field of research in recent decades (Fischer et al. 2020; Kerres 2020; Livingstone 2004; Potter 2010; Reddy et al. 2020; Trültzsch-Wijnen 2020). Various studies have been conducted to evaluate the importance of media skills and appropriate frameworks such as the Frankfurt Triangle, the 4Cs, and the Digital Competence Framework for Citizens (DigComp) (Brinda et al. 2020; Carretero et al. 2017; Pfiffner et al. 2021; Rasi et al. 2019). Livingstone (2021) contends that

formulating a general definition of media literacy with universal criteria is challenging due to the diverse contexts and target groups involved. Concurrently, Hug (2010) observes an ongoing trend towards the emergence of new literacy concepts with a broad focus. He asserts that these concepts must be precisely defined and critically examined. Nevertheless, the current understanding of media literacy can be summarized as skills in “accessing, analyzing, evaluating, and creating media messages,” the application of “creative and playful forms of multimodal media content production,” “abilities to reflect on one's communication behavior, to act and participate in society,” and finally, the capacity “to promote one's digital well-being” (Rasi et al. 2019, 1). In terms of frameworks, Zorn (2010) summarizes the core elements of the various frameworks and models as the development of skills including the “selection, production, usage, and evaluation of media” (Zorn 2010, 187).

In the German-speaking discourse, definitions of media literacy range from the ability to use various media for one's own communication and activity (Baacke 1999, 119) to the ability to use media in a self-determined, creative, and socially responsible way as well as to move in media contexts (Tulodziecki 1998, 9). Since these early definitions, different debates have arisen around the meaning of the term (Aufenanger 2001; Hugger 2008; Schorb 2017; Spanhel 2011; Tulodziecki 2015).

Around 2010, broad discussion unfolded around the scope of the term media literacy. This discussion was marked by the ambivalence inherent in the term, often perceived in various approaches as both a “general requirement or significant quality for action in the media field” as well as an “objective in the sense of a desired level of competence” (Tulodziecki 2010, 22). It has also become imperative to refine the conceptualization of the term in the era of digitalization and widespread access to digital media and thus to transcend the understanding of media literacy that evolved in the analog era (Zorn 2010). Given that the discourse has revolved primarily around the educational dimensions of media literacy, authors have proposed a distinction between an “administrative-pedagogical perspective”, a “pedagogical-practical theoretical perspective,” and an “educational-theoretical-reflective perspective” (Jörissen 2010, 228).

One recent promising perspective summarizes various literacies under the two dimensions of media literacy and information literacy in order to capture the current debate and to cluster the different individual skills within a structural concept (Trültzsch-Wijnen 2020). In this context, Trültzsch-Wijnen describes media literacy as the ability to critically understand and evaluate media content, and information literacy as the technical skills of usability, knowledge about access, and identification of application strategies (Trültzsch-Wijnen 2020; Soßdorf 2023). Critical media literacy (CML) goes beyond the notion of classical media literacy, strongly emphasizing critical engagement with power dynamics and ideologies shaping media content and representation in media discourse (Kellner and Share 2007). Simultaneously,

expanding the understanding of information literacy, data literacy (DL) addresses the promotion of skills necessary to navigate an increasingly datafied information environment (Carmi et al. 2020; Schüller et al. 2019). Following this division, the two literacies addressed in this paper, CML and DL, represent these two approaches to media by a) looking at the media contexts and b) referring to skills in the use of informational data.

A critical perspective toward the media recognizes that the presentation of information incorporates power imbalances. To foster a critical comprehension of both manipulative communication and the Internet as a distribution medium, individuals must have broad knowledge and a deeper understanding of (social) media functionalities (Rieger et al. 2017). Consequently, a thorough investigation of media content must also examine how the media typically influence audiences in interpreting and navigating messages related to factors that favor dominant groups (Higdon 2020). In view of the current impact of phenomena such as hate speech, filter bubbles, and fake news and how these affect the functioning of our society, it is crucial to understand CML as a key competency (Peissl et al. 2018). This competency encourages people to consider why a message was sent and where it came from (Kellner and Share 2007).

Ganguin and Sander (2015) define CML as the ability to analytically, reflexively, and ethically evaluate and judge media content. Following Kellner and Share (2005), CML entails the development of skills in analyzing media codes and conventions, and the ability to critique stereotypes and ideologies as well as the competence to interpret media texts' multiple meanings. Therefore, CML goes beyond analyzing the content of media and delves into understanding the power dynamics associated with the creation and dissemination of that content. Additionally, it assists individuals in responsibly consuming media, including discerning and assessing media content, critically examining media forms, exploring media effects, and, based on those abilities, deconstructing alternative media. In the context of teaching CML, dealing with disinformation is undoubtedly important (Maloy et al. 2022; Peissl and Sedlaczek 2022). It is crucial to highlight that media culture may contribute to the promotion of racism, ethnocentrism, and various forms of prejudice. It may also endorse disinformation, problematic ideologies, and questionable values. Thus, advocating for a dialectical approach to the media and questioning ideology, bias, and connotation of content are essential to CML (Kellner and Share 2005). The notion of ideology critique embedded in CML education can, among other things, equip individuals to quickly recognize right-wing extremist maneuvers such as the spread of disinformation and hostility towards specific social groups in the digital space.

DL is among the newer competencies that developed structurally out of the term information literacy, which was introduced in the context of libraries and the corresponding need to deal with collected information (Carmi et al. 2020; Schüller

et al. 2019). The term DL was coined with increased digitalization and datafication to describe competencies necessary to address these developments. Yet demarcations between multiple literacies such as information, statistical, and digital literacy remain blurred (Bhargava et al. 2015; Gould 2021; Schüller et al. 2019). As such, DL is subject to multiple definitions, ranging from the definition of concrete skill sets as the “ability to read, work with, analyze, and argue with data as part of a larger inquiry process” (D’Ignazio and Bhargava 2016, 84) to a more general empowerment of individuals to navigate and engage with their own data-based environment (Bhargava et al. 2015; Schüller et al. 2019). Importantly, these definitions underscore the multifaceted nature of the term, including a call to action based on acquired literacies (Bhargava et al. 2015; D’Ignazio and Bhargava 2016). Multiple frameworks have sought to capture the facets of DL and their implications for a data-literate society (Bhargava et al. 2015; Carmi et al. 2020; Schüller et al. 2019). However, societal and technological developments constantly add new aspects to the field. Advances in computational analytics and artificial intelligence create new opportunities and challenges to data value creation and lead to the emergence of terms such as data science literacy and big data literacy (D’Ignazio and Bhargava 2016; Sander 2020; Schüller et al. 2019). Likewise, the increase in online dis-, mis-, and malinformation requires a revision of the DL concept (Carmi et al. 2020; Koltay 2022). As such, discussions on critical DL concepts emphasize the ability to critically evaluate data and datafied environments in terms of their backgrounds, intentions, and modes of operation (Koltay 2022; Sander 2020).

4. Synergetic Linkage of Critical Media Literacy and Data Literacy

In the academic discourse, multiple efforts have been undertaken to link or distinguish different literacy fields. Kellner and Share (2005) use the term “multiple literacies” to refer to the many different competencies needed in today’s society to access the social public sphere and to be able to interpret, criticize, and participate. Koltay (2022) argues that the ongoing technological conversion of media, information, and communication systems encourages the combination of different sets of literacies, hypothesizing a potential union of data and media literacy. In contrast to this, Carmi et al. (2020) state that the sets of literacies reflect on the political and technological context of their development, leading to newer literacies such as data or digital literacies encompassing older forms of media or information literacy. Yet Twidale et al. (2013) claim that despite the conceptual overlap, literacies should be distinguished depending on the scale, genre, and usage. However, especially when turning towards a critical literacy perspective, it becomes obvious that the content and data dimension are closely interconnected (Musi et al. 2022). McDougall (2019) argues for acknowledging the intricacies of “dynamic literacies”, blending or transcending the

boundaries between different spaces and roles. As such, we believe that to combat online disinformation, a close examination of the interplay between media and data literacy competencies is crucial for educators, learners, and tool developers alike. To do so, we reflect in Table 1 on the CML dimensions of awareness, reflection, and empowerment proposed by Schmitt et al. (2018).

Dimension		Description
CML 1	Awareness	Awareness in this case means to become aware of the existence of disinformation and possibly encountering it (Schmitt et al. 2018): <ul style="list-style-type: none"> • Knowledge of various forms of disinformation and manipulation (e.g., rhetorical resources, distorted articles, and pseudo-media outlets) • Deeper understanding of how media and online media, including algorithms, operate Awareness can trigger subsequent activities such as reflection.
CML 2	Reflection	Reflection in the context of CML is about applying analytical criteria to media content and determining whether or not it is deceptive (Schmitt et al. 2018): <ul style="list-style-type: none"> • Conscious consideration and thorough thinking before an article is liked or shared, or a headline is taken at face value • Utilizes an individual's knowledge, abilities, and attitudes to critically evaluate (media-communicated) information based on specific criteria including credibility, source, and quality
CML 3	Empowerment	Individuals' confidence in their ability to detect manipulative messages, participate in social discourses, and actively position themselves against disinformation is cultivated through empowerment strategies and methods: <ul style="list-style-type: none"> • A certain form of behavior that encompasses a person's ability to recognize and state doubts about specific content as well as express their own thoughts. Empowerment relies on individuals' knowledge (awareness) and analytical thinking (reflection) regarding messages conveyed through the media. Moreover, it could also be a factor that anticipates increased awareness.

Tab. 1: Dimensions of the CML Framework by Schmitt et al. (2018).

Awareness, reflection, and empowerment are considered intertwined dimensions. We show in Table 2 how they can be enriched by the three domains of data citizenship – data thinking, doing and participation – which in turn subsume different competencies of DL (Carmi et al. 2020; Yates et al. 2020).

Dimension		Description
DL 1	Data Thinking	<p>Data thinking revolves around aspects of critical data understanding when citizens view or analyze situations from the angle of data (Yates et al. 2020). First, it involves attitudes and knowledge, such as understanding aspects of data collection or the data economy (Carmi et al. 2020; Yates et al. 2020; Yates et al. 2021):</p> <ul style="list-style-type: none"> • Data and data products are increasingly disseminated and contextualized both in the field of professional journalism and in social media (Schüller et al. 2019). • They can be misused to serve vested interests (Pullinger 2021) such as recruiting unsuspecting adolescents for far-right groups (Liang and Cross 2020). • Platform design and business models can influence user behavior (Carmi et al. 2020). <p>Thus, promoting data thinking could be a valuable extension to the dimension of awareness in a datafied environment. Additionally, data thinking also includes aspects of critical usage of data such as the ability to critically consider and discuss data analysis and communication (Yates et al. 2021), which makes it relevant for the dimensions of reflection and empowerment and overlaps with the aspects of data doing and data participation.</p>
DL 2	Data Doing	<p>In a data-driven debate, critical reflection on and active positioning in relation to content can necessitate thinking about and engaging with the underlying data. Along with data thinking, literacy skills in actively engaging with data (data doing) (Carmi et al. 2020; Yates et al. 2020) may be essential to the dimension of reflection and empowerment. Data doing revolves around aspects of data engagement on a day-to-day basis (Yates et al. 2020):</p> <ul style="list-style-type: none"> • Everyday data engagement may be necessary when reflecting on content. On social media, for instance, users might need to identify and assess a data source in a post or interpret different formats that data is presented in (Yates et al. 2020). • Aspects of data doing such as data creation or citation in a blog, on social media, or in other contexts (Yates et al. 2021) might play a role when envisioning empowered citizens who actively participate and position themselves in the public sphere. • On an individual level, skills of data literacy can support empowerment when citizens are enabled to utilize data in their local context (Bhargava et al. 2015).
DL 3	Data Participation	<p>Data participation describes the ability to engage proactively with and about data, going from an individual to a network perspective, focusing on the “collective and interconnected nature of data society” (Yates et al., 2020, 10) and could thus enrich the dimension of empowerment:</p> <ul style="list-style-type: none"> • Highlights how DL enables citizens to actively shape the community by getting involved in disinformation debates, utilizing data for civic action or supporting others in their literacy journey (Yates et al. 2020). • Goes beyond an individual literacy level toward ways of mutual and collective enablement. It seeks to counteract disparities of power and feelings of disempowerment in datafied environments (Yates et al. 2021).

Tab. 2: Dimensions of the Data Citizenship Framework and their relation to CML.

As awareness of disinformation grows, so does the ability to reflect critically upon it. Critical reflection on deceptive content, in turn, necessitates knowledge regarding the presence of such content on the Internet. Reflection on deceptive content affects the feasibility to proactively oppose such content (empowerment) and may increase awareness of the contributions of those who have already stood up against disinformation on the Internet (Schmitt et al. 2018). Therefore, essentially, CML aims to promote both critical consumers and creators of media (Allen et al. 2022). Concepts of DL from data thinking to data participation can support dimensions of awareness and reflection while enriching aspects of empowerment in particular.

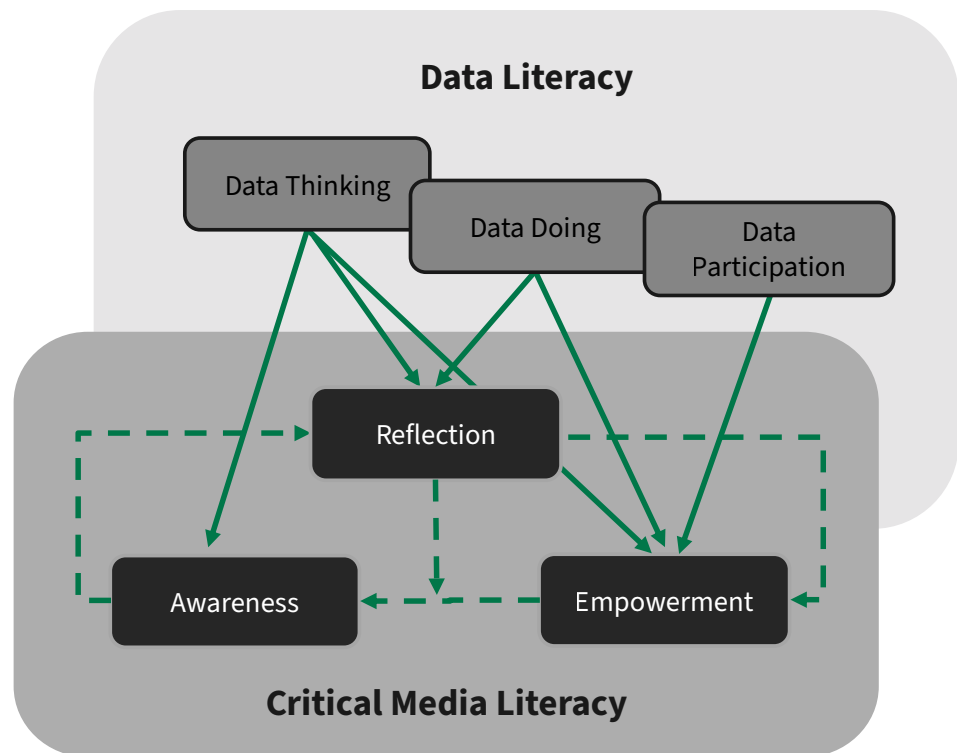


Fig. 1: Synergistic Literacy Model Against Disinformation.

From our perspective, these two concepts can be combined in our Synergistic Literacy Model Against Disinformation (Figure 1) by referring to the elements of data thinking, doing, and participation, which are subsumed under the umbrella term DL, as elements that can enhance the development of a broader critical mindset on the individual level along the three dimensions of CML (awareness, reflection, empowerment). Accordingly, we propose to allow for their interplay in our new theoretical concept and in the groundwork for developing practical media educational formats and methods.

5. Proposing Learning Opportunities and Digital Infrastructures for Democratic Resiliency

Having established the theoretical foundation for the amalgamation of CML and DL (see Tables 1 and 2), we shift our focus to the tangible benefits that emerge, particularly in practical application and influence. Many fundamental issues in dealing with media and information in different areas of society are not new, but have to be reclassified for the digitization context (Peissl and Sedlaczek 2022). Competent and critical media action is thus becoming a central social challenge in the digital age. A prime example of this can be seen in the ongoing debate on approaches to combat disinformation (Diepeveen and Pinet 2022). Interventions can highlight the individual's responsibility to develop necessary literacies, while structural interventions can invoke platform design or tools (Diepeveen and Pinet 2022). The latter might include interventions focusing on facilitating media or data handling or supporting educational goals (Twidale et al. 2013). In this section, we therefore explore the need to create learning opportunities for individuals to build literacies and investigate the role that technological interventions can play. Furthermore, we argue that this conceptual linkage can play a significant role in terms of 1) a more adequate and target-group-specific conceptualization of digital learning settings, 2) a more accurate development of digital structures and usable tools, and 3) positive impacts on a societal level.

5.1 Using Emerging Learning Opportunities

When it comes to learning opportunities, it is crucial to regard the learner as a person with several modes of perception and therefore offer a setting that attracts different senses and modes of learning (Pritchard 2017; Schunk 2012). Practically, educators must consider this context while fostering a critical data mindset. They can employ diverse media like text, videos, podcasts, and images to present content. Additionally, a mix of activities such as reading, researching, manipulating, and creating data should be integrated to provide a comprehensive data handling experience. This approach enables learners to grasp, interpret, and apply data within novel contexts, aligning with their unique learning preferences. To make a learning experience more realistic and relatable to everyday life, it has been shown that digital learning should not focus on individual competencies but rather address a set of similar and connected skills (Fischer et al. 2020; Moser 2020; Soßdorf and Gallach 2022). Therefore, we suggest reflection on complex problems related to data, based on real cases with multiple dimensions. This enables individuals to learn by dealing with actual data problems in our world but also to have a learning opportunity that shows how important data skills are interconnected and interdependent.

When talking about digital skills, the focus should lie on the development and establishment of a certain digital mindset, which means being open to new digital techniques and methods, being self-confident in navigating the digital sphere and finding individual solutions, and being aware of the permanent digital condition (Soßdorf 2023; Stalder 2016) that affects our lives. It is important to be aware of the fact that digital platforms and tools are always available for our convenient use, but under the condition that data is scraped and monetized while we are navigating in the digital sphere. Keeping these conditions in mind, reflecting on them, and being able to find as well as choose individual paths in everyday life – with or without the use of digital tools or settings – is what we refer to as a digital mindset. It can thus be regarded as an overarching, general skill (Soßdorf 2023) since it is not specifically bound to certain tools or platforms but addresses a way of living and coping with the challenges of the digital life.

5.2 Leveraging Digital Infrastructures and Tools

The idea of promoting digital learning brings with it certain requirements for infrastructures and digital platforms. Digital tools and infrastructures to support the handling of data and information already exist on a large scale (D'Ignazio and Bhargava 2016; Musi et al. 2022): They include powerful tools such as R, Python, and Excel, which need training to be used efficiently, but also simpler tools that facilitate individual tasks (D'Ignazio and Bhargava 2016). Although all these kinds of tools enable people to work with data, they do not necessarily support DL learners (D'Ignazio and Bhargava 2016). The latter requires system designers to anticipate the needs of their users as learners and to focus on learning processes (D'Ignazio and Bhargava 2016). For the specific context of strengthening literacies for combating dis- and misinformation, Musi et al. (2022) identified 22 gamified tools that are designed to enable learning. However, they point out that although the tools are intended to be educational, they require comprehensive assessment to improve their effectiveness. In this context, we propose that theoretical literacy models could help to both guide the design of tools and enable their structured evaluation. Applying our structural model may help to recognize functionalities of tools that can target different educational outcomes from raising awareness to supporting reflection to empowering users. Likewise, the tool's focus can be on different activities from supporting critical thinking to enabling active doing to social participation. Through the debunking tool New-Wise, for instance, the user's ability to judge the truth in headlines is assessed through a direct debunk, promoting awareness of and reflection on deceptive news content. The user is invited to think about the information contained in the headline, but does not require active doing in terms of checking sources or searching for additional data. Debunking tools contain mainly

gamification elements, whereas pre-bunking tools encourage engagement in addition to awareness and critical reflection through sophisticated forms of explicit gameful design, such as simulations and serious games. In the Vaccination News chatbot, for instance, users are guided through a sequence of critical inquiries that highlight possibly flawed arguments, cautioning them to question the credibility of a news piece. Through this gamified pre-bunking tool, users are encouraged to think about the underlying data, but also to actively handle data on their own, for example, by accessing and evaluating other sources. The game spurs users to critically review content (reflection) and enables them to actively express their doubts (empowerment) (Musi et al. 2022). While the latter is an important prerequisite to data participation, the game does not further animate the user to utilize their skills for participation.

For existing tools, the application of our theoretical model allows us to systematically describe a tool's focus which could in turn help to assess the technological landscape and identify gaps. In turn, new technologies could be developed alongside all or a subset of our three dimensions (awareness, reflection, empowerment) to assist individuals in developing the needed skills. Likewise, the dimensions can be utilized to systematically evaluate the effectiveness of tools. As such, our framework could be useful to system designers in both a conceptual and operational phase of tool production.

Evaluation of tools is especially important as they come with certain limitations and can potentially produce side effects, depending on the usage scenario. The use of simulation tools like Bad News, GoViral!, and Fake It To Make It places players in the role of a disinformation website editor, helping them to understand the mechanisms behind creating and spreading fraudulent content. This implies the risk that players may become more sympathetic towards the creators of fake news, especially if the playful element of the application is in the focus of the specific usage scenario. For instance, empirical evidence from studies on video game design suggests that players might develop empathy towards their in-game characters and see them as role models for future behavior (Konijn et al. 2007). To address this bias, GoViral! includes face-threatening outcomes, where players receive messages from disappointed friends about their behavior. Similarly, Harmony Square visually portrays the harm caused by disinformation by showing the game's neighborhood going downhill. Despite these efforts, fictional goals like earning money for personal needs may make the decision to spread disinformation more relatable and justifiable to players (Musi et al. 2022). Furthermore, such gamified tools may only reach a very limited target group: As these tools have a clear educational purpose, they attract individuals who are already interested in learning about how disinformation spreads. However, to effectively reach people who are vulnerable to disinformation

or have authoritarian right-wing tendencies, and thus strengthen their democratic resilience, it is essential to include educational content about disinformation in games that have a broader scope and appeal to a wider audience (Musil et al. 2022).

Eventually, in the development of educational tools and platforms, it is essential to include instruction on argument-checking in addition to proper fact-checking (Brave et al. 2022). Argument-checking means evaluating the overall argumentation for its acceptability, relevance, and sufficiency. This approach not only empowers individuals to distinguish factual from deceptive information but also equips them with the skills to become better content producers. Existing platforms and digital systems can easily be addressed as topics of learning sessions to critically analyze their mechanisms with the aim of proposing necessary regulations and developing appropriate policies. Moreover, complex problems that occur on platforms can be addressed, not only on the individual level but also on a societal level, which requires regulation and responsibility on the part of the digital organizations and corporations as well as policy makers. It is crucial that individual learners as well as society at large have the opportunity to reflect on platforms' strategies and procedures and have a chance to exert influence. When addressing right-wing extremist movements, it is vital to note their robust digital organization and embedding of various nationalistic characteristics. To effectively counteract their influence, democratic societies must grasp media dynamics and influencing tactics. This allows the development of tandem literacies: critical analysis of content disseminated by such groups, and data skills in comprehending platform operations and data leveraging to disseminate ideas.

5.3 Society and Democracy

As developing the aforementioned skills is a collective societal endeavor, resources are required on the individual (micro) level as well as on the educational (meso) and political (macro) level. The overarching goal is to enable learners to be(come) active citizens, to recognize their interests, opportunities, and responsibilities arising from digitization, and to make well-informed decisions about their media actions (Peissl et al. 2018). In this sense, the Synergistic Literacy Model applies not only to the individual level, but also to the societal system as a whole, which must develop appropriate competencies to stabilize and strengthen itself from within. Therefore, we would like to emphasize that it is not only the individual who is responsible for acquiring appropriate skills to participate in an increasingly complex and digital social space: Representative institutions must also work to create appropriate framework conditions so that necessary competencies can be learned. The transitions between the roles of the individual, institutions, and society as a whole are fluid. In the first sense, literacy interventions benefit the individual, but in the second sense,

they ideally enable the individual to initiate and support the learning process of other people. Accordingly, individuals become literate not only for their own needs and purposes, which are described in the Synergistic Literacy Model: In the stage of empowerment, individuals may feel encouraged to actively support other people in building their own literacy skills. The critical skills this requires involve agency, as learners and educators become co-creators of their own knowledge and competencies (Wright et al. 2023). The model can thus also be adapted on the societal level, where individuals can benefit from each other's skills and knowledge.

Disinformation poses an existential threat to democracy as without access to accurate information, individuals can be prevented from realizing their own societal visions. Ultimately, the manipulation of media hinders meaningful participation in shaping society (Higdon 2020). Those who would like to participate in the media discourse must be capable of critically analyzing and assessing the social dynamics and significance of this discourse (Peissl and Sedlacek 2022). According to research conducted by Pennycook and Rand (2018), the primary factor behind vulnerability to disinformation is inadequate critical thinking rather than other factors such as partisan bias. Therefore, to effectively combat the dissemination of deceptive information, users need to develop a higher level of critical media competence. An examination of critical competencies should enable individuals to expand their ability to act in a democratic society, to form opinions independently, to constructively shape media content themselves, and to participate in political life (Peissl and Sedlacek 2022).

6. Conclusion

In this paper, we develop a new model to combat (right-wing extremist) disinformation online. In our Synergistic Literacy Model, we combine two digital competencies, critical media literacy and data literacy, and argue that in combination, they can function as a theoretical foundation for a digital learning environment.

Our theoretical starting point is the so-called “digital condition” (Stalder 2016), which describes today's reality as a permanent digital environment in which our digital and analog ecosystems are in a flux. From this perspective, people are both users and creators of digital content and culture and therefore need certain competencies as individuals but also as members of a democratic society. After decades of discourse on the necessary skills for a digitized world, two competencies have been identified as distinct but at the same time intertwined: information literacy and media literacy.

Our paper takes up this emerging discourse and explores an interpretation resulting in a Synergetic Literacy Model to combat disinformation, especially in the context of right-wing extremism. This model suggests combining the two literacies

CML and DL. While CML refers to the skill of critically reflecting on media content, digital ecosystems, and the impact of digital exposure and usage, DL describes the skill of being able to understand, interpret, use, and evaluate data and data-driven products. We show that the three central dimensions of CML – awareness, reflection, and empowerment – can be partially connected to the DL concept in order to create stronger synergies. DL, on the other hand, can provide meaningful extensions to CML with its elements of data thinking, data doing, and data participation. Through these linkages in our model, we show how aspects of CML and DL can enrich each other and therefore create a helpful blueprint for the design of digital learning settings as well as digital platforms.

Concerning the implications for digital learning settings and digital platforms, we set forth several considerations for a concrete conceptualization of learning opportunities. First, we argue for a focus on the learners' perspective, where educational setups, methods, and material are composed in such a way that learners with diverse backgrounds and requirements can take part equally. Second, we suggest that digital skills should be regarded as connected abilities to navigate the digital sphere, and that educational settings must therefore be interlinked and focused on realistic cases and examples. As a third proposition, we assert that cultivating a digital mindset is essential for confidently navigating, identifying, and resolving digital challenges in everyday life.

In addition to the broader learning context, we contemplate the function of digital infrastructure in fostering literacy development, emphasizing the relevance of our new integrated theoretical model. Through an exploration of well-designed digital interventions, we illustrate how they can be methodically aligned with our model, aiding the identification of right-wing organizations and technological gaps. In assessing the constraints of technological solutions, we advocate for a critical evaluation of their efficacy and deliberation on individual versus structural accountabilities. Beyond the individual reasonings, we also argue that having the abilities and knowledge in the use of digital skills can enhance democracy. Detecting disinformation, engaging in discussions to counter fake news, and collaborating with others are vital in safeguarding democratic integrity and might thereby become a potent countermeasure against right-wing extremism.

Finally, our model can serve as a foundation for assessing the efficacy of digital literacy interventions and inspiring the creation of new literacy combinations. We encourage the scientific community to seek additional synergies among theoretical concepts and frameworks for digital skills. Given the complex challenges we face, conceptual connections may generate fresh insights into prevailing (harmful) frameworks. It is worth noting that the subject matter discussed here represents just one focal point, and that the model can be seamlessly adapted to other critical digital contexts such as climate communication or cybercrime.

In this paper, we focus on the dynamics of right-wing extremism in a digitally connected world and assert that it is imperative to disrupt these dynamics to strengthen our democratic culture. This proposal extends to the academic community, urging continuous vigilance, identification of emerging threats, and exploration of future research directions. As Twidale et al. (2013) argue for the case of fostering DL, we need a “sociotechnical ecology where data, information, people and technology co-evolve” (Twidale et al. 2013, 250). We believe this remains true when extending the argument to fostering literacies against fake news. Rather than adhering to one literacy curriculum or intervention to combat disinformation, we must develop multiple frameworks and approaches to fit the changing shape of our digitized society.

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