

Cultivating Ecological Literacy: A Critical Framework for Understanding and Addressing Mis- and Disinformation

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ABSTRACT

This conceptual paper highlights limitations within existing approaches to mis and disinformation and offers a cross disciplinary approach that draws from social shaping of technology and critical informatics to explain and understand these complex informational phenomena. Different scholarly perspectives from policy, technical, and information literacy spheres, often narrowly focus on information practices of actors or components of the technical systems and policy frameworks undergirding these systems often their ‘locus of change’, or concept of the problem and solutions, do not acknowledge the interconnected complexities inherent to mis and disinformation. Our proposed **conceptual** intervention can be useful to the information science and technology research and teaching community as it offers opportunities to cultivate a complex form of what Milner and Phillips describe as “ecological literacy” to holistically understand the mis- and disinformation problem domain as an interconnected set of sociotechnical systems.

KEYWORDS

ecological literacy, locus of change, misinformation, critical informatics, social shaping of technology

1. INTRODUCTION

Popular press articles, think tanks, and government legislation suggest that mis- and dis-information is a unique problem threatening the social contract and the capacity for citizens to inform themselves and engage in sensible participation in democracy (Martínez, 2018; Tavernise, 2016; Bernstein, 2021). Because of unique threats to idealized modes of participation in democracy, this discourse is accompanied with calls for quick but thorough solutions and interventions to correct these problems of false and misleading information online. Indeed, a research and development industry has arisen around the topic (boyd & Haven, 2021; First Draft, 2021; Witness, 2018). They see this discourse and concomitant mobilization as a ‘moral panic’ with war-like metaphors. False and misleading information and those spreading it are posed as adversaries to be punished or defeated, implicit with the unstated assumption it is a desirable and necessary return to “civil society” where informational expertise and gatekeeping are unquestioned (Bratich, 2020). This drive towards the “war of restoration” obfuscates that mis-and disinformation has been present in propaganda and modes of manufacturing consent for centuries, and that everyone’s interests have never been appropriately reflected in “civil society” (Bratich, 2020; Paris, 2021).

In this paper we offer a conceptual framework for information practitioners and educators to untangle complicated ethical issues around information and sociotechnical systems evaluation related to mis- and disinformation and briefly discuss an educational intervention to test our conceptual framing. **Here we understand sociotechnical systems as those informational systems that contain overlapping technical and social components, recognizing the co-constitutive interplay of components of sociotechnical systems and agents in these systems (Sawyer & Jarrahi, 2014; Tewell, 2015).** Definitions and approaches to the study of mis- and disinformation vary widely across information and information-adjacent disciplines such as human and computer interaction, communication and media studies, information studies, sociology, and psychology. The ASIST conference theme “Crisis, Transition, Resilience: Re-Imagining an Information-Resilient Society” invites interventions for more nuanced discussions around information in many informational contexts that are increasingly characterized by and operating within overlapping crises. Here, we use Caroline Jack’s (2017) “Lexicon of Lies” definition of misinformation as false information that is unintentionally generated, and/or unintentionally spread that are in line with Fallis’ (2009, 2015) definitions of the phenomenon. Jack contrasts this from disinformation that is knowingly false, and spread with the intent to deceive, often for political purposes. We refer to mis- and disinformation as such, or combine the types by calling it “false and misleading information”.

While scholarly approaches to mis- and disinformation vary, they almost always hinge upon an explicit or implicit imperative for change of some form. This imperative and its logic often blame the practices of actors or components of the systems for the problem, and thus target actors and/or systems as the primary ‘loci of change’ (Feenberg, 2017, Paris et al., 2022). For instance, scholarship in media and information education places a primary ‘locus of change imperative,’ upon individuals and educational institutions to cultivate greater literacy among the populace to assume personal responsibility to change their media and information practices, how they contextualize, use, and share information, at the individual level (Savolainen, 2008; Schatzki et al., 2001). Other scholars address mis- and dis-information from their particular scholarly lenses, often placing emphasis on one or two primary loci for solutions-oriented change, for instance, human-computer interaction (HCI) scholarly research which narrows in upon technical interventions, such as changing the technical capacities of sociotechnical systems act as the primary lever.

The complexities inherent to navigating across all of these varied perspectives on mis- and disinformation creates both an opportunity and challenge for information fields. Below, we set out an approach building on ecological literacy, and discuss how it improves upon more narrow perspectives. While our work also invites an educational intervention towards public actors, our holistic approach builds on critical informatics research paradigms that acknowledge how mis- and disinformation phenomena transverses socio-technical systems, and acknowledge the burden on many varying types of actors, to understand these interdependencies which include the existence of varying ideological frames among said actors, and the need for improved communication and dialogue across polarized ideological boundaries.

2. LITERATURE REVIEW: A NEED FOR ECOLOGICAL LITERACY

To respond to criticisms around the war of restoration and overblown hype around mis- and disinformation, and to veer away from overly partisan modes of explaining and understanding false and misleading information, we draw from Milner and Phillips’ model of ecological literacy (2020). In this model, the problems, causes, and possible solutions for mis- and disinformation must address sociotechnical systems dynamics that exist within structures of power, and importantly that systems shape and are shaped by agents. Milner and Phillips note:

Unlike liberalistic literacy, ecological literacy doesn’t fight against the affordances of the information ecosystem. It doesn’t assume that falsehoods are easily decontaminated by the application of facts, or indeed, that falsehoods are the only pollutants to worry about. It doesn’t cast people as atomistic islands unto themselves. Instead, ecological literacy emerges from network complications. It foregrounds the downstream, communitarian consequences of falsehoods and facts alike. And it takes people’s [ideological] frames seriously. These frames might not be true, but they are real; they shape how people navigate the world. Understanding these frames—indeed, approaching them as basic features of the information ecosystem—is key to protecting our public lands. To get us there, ecological literacy zooms out, way out, to survey the entire landscape. (Milner & Phillips, 2020)

As opposed to seeing a chaotic and crisis-fomenting information and communication ecology as an insurmountable problem, Milner and Phillips encourage disentangling the complex, connected components of socio-technical configurations that have allowed mis- and disinformation to proliferate. Importantly “ecological literacy” understands the problems with regard to structural power as its primary “locus of change,” similar to interpretations of *social shaping of technology (SST)* (Barad, 2003; Wajcman, 2015) and critical informatics (Noble, 2016; Sweeney & Brock, 2014).

2.1 Scholarly approaches to understanding Mis/Disinformation (and their limitations)

In advocating for the ecological literacy approach, here we present and critique a review of scholarly approaches commonly engaged in information fields, organized according to their targeted “loci of change.” We specify the observed practices and components of systems involved in the spread of false and misleading information that are targeted as primary and often described and assumed as causal, by followers of different scholarly perspectives. We chart these observations and their limitations, to prioritize and advocate for more robust models for thoughtfully engaging a complex range of mis- and disinformation phenomena. do we want to add any specifics from the curriculum here?

2.1.1 Frameworks placing emphasis on information practices

Individual information practices are the most common causal problem domain, and intervention target of change, addressed in the study of the spread of mis- and disinformation. Studies across globe blame social media users’ poor media and information literacy skills as the primary contributor for the generation and spread of mis- and disinformation campaigns (Chakrabarti et al., 2018; Dodda & Dubbudu, 2019; Machado et al., 2019; Nugent, 2018; Guess et al., 2020). However, people engage in personal, mixed online and in-person networks adhering to a variety of communication norms (Matassi et al., 2019). People share information because they want to draw attention to that information as false, they hope it is true, because it might be true and it might matter to someone, or

because the information simply coincides with their view of the world (Kreiss, 2017; Lazer et al., 2018; Osmundsen et al., 2020; Tripodi, 2018; Wagner & Boczkowski, 2019). Moreover, in some global contexts, predicating “good information and media literacy skills” on dominant models of information verification and adherence to legacy press does not hold in countries with different political economic constellations around repressive governments and the press (Lim, 2020; Bauer & Nadler, 2021). While media and information literacy solutions are intended to promote critical thinking skills, given the vast disparities among users and their situation in various culturally, economically, or politically non-dominant groups both globally, and within their own countries, scholars have become concerned that critical thinking encouraged in literacy programs may result in promoting deeper doubt and nihilism, instead of discernment and understanding (boyd 2018a, 2018b; Bulger & Davison, 2018).

Research and solutions for improved media literacy largely disregard the above complexities, and instead propose public training for information consumption and distribution, often through information evaluation checklists (Berkeley Instruction Services, 2021), directives (Caulfield, 2017; Faix and Fyn, 2020) and public information literacy campaigns online (Guess et al., 2020). Yet critical information literacy (Haider and Sundin, 2020; Tewell, 2015; Tuominen, et al., 2005) suggests the inadequacy of these one-off solutions for engaging online contexts and suggest broader literacy campaigns combining these aforementioned methods (Huguet et al., 2019). However, targeting individualized information practices are just one possible locus of change for problems of false and misleading information online, because the problem extends beyond individuals to complex systems in which these individuals are among other agents and systems components (Bulger & Davison, 2018; Paris & Donovan, 2019).

2.1.2 Frameworks placing emphasis on technical fixes and tools for content moderation

Technical fixes in systems and platforms for mis- and disinformation is the second common locus of change. Vosoghi et al. (2018) found by mapping the transmission of false and misleading information through online social networks that mis- and dis-information reach wider audiences more quickly than true information. The reason for this is twofold. Online platforms are designed to boost and reward user engagement (Crain & Nadler, 2019). And, as noted in the last subsection, people engage with novel content in many ways for many different reasons, including, but extending far beyond sharing messages online as endorsement of the truth content of any given message. Computer science, data science, and some branches of human-computer interaction (HCI) advocate “pro-social” engineering, that requires any combination of detecting bots, false information, and/or bad actors, than any mixture of labeling, debunking, taking down, banning actors, and/or limiting spread of false or misleading content (Brashier et al., 2021; Garimella et al., 2017; Gupta et al., 2013; Jhaver et al., 2019; Turek, 2018). But these fixes for media literacy have been found to be ineffective in limiting spread of these messages and are commonly seen as proof of bias or censorship against certain types (most often conservative) of speech (Lyons, 2018; Ognyanova, Forthcoming; Tromble & McGregor, 2019).

Technology companies and the tech industry benefit and profit economically from the existence and spread of false and misleading information. Promoting technical fixes as a primary locus of change upholds a common technological determinist argument that the technology is primarily to blame for mis- and disinformation, and simply needs to be “tweaked” to promote better outcomes. Conveniently, assumptions around technical fixes as a locus of change promise that thorny social and political problems like mis- and disinformation can be addressed at a technocratic and disembodied ‘safe distance’. Moreover, these technical fixes are most often executed by the offending tech companies themselves with no transparency or outside accountability.

Advancing technical fixes as a locus of change legitimizes and supports the logics of market-driven ideology, along with the misogyny and white supremacy shown to underpin the technology industry (Costanza-Chock, 2020; Ensmenger, 2012; Noble, 2018) which escapes outside examination and critique. Given these limitations, we suggest caution in adapting technological determinist approaches that assume for instance that ‘inaccurate’ information can be algorithmically identified and addressed, thereby overlooking the fact that truth and falsehood are socially and culturally contingent, and do not exist as discrete variables to be solved by mechanistic systems.

2.1.3 Frameworks placing emphasis on governance by national/state institutions

Policy and legal studies identify state and federal policy as the locus of change for the problem of false and misleading information and argue that technology evolves too quickly for the comparatively slow processes of governmental procedure to keep up with (Citron, 2016; Franks, 2018). The result is that tech companies are allowed to make ad hoc decisions that benefit their companies that serve as practical precedent that is difficult for courts and legislation to dismantle. Calls to break up big technology and corporate media conglomerates aim to address the overall problem of monopoly and demonstrate government leaders’ concerns that these corporate interests that shape public discourse hold outsized power.

Understanding how harmful speech has already been adjudicated offers some ways forward considering policy around mis- and disinformation online. For example, inciting, violent, and defamatory speech are not protected by the First Amendment in the United States’ Bill of Rights; increasingly, neither are child pornography and revenge

porn. But in all cases, thanks to Section 230 of the Telecommunications Act of 1996, offending users are targeted for punishment, while platform owners are left to continue to profit from such speech. As other legal scholars argue that interpretations of the law and enforcement of legislation support the status quo as they benefit the already powerful and harm those who are already disenfranchised (Citron, 2016; Cover, 1986; Franks, 2018, 2019). This has been further demonstrated in recent years as investigations and hearings around Facebook, Apple, and Google's monopoly status, and role in promoting false and misleading that leads to real-world consequences have not produced meaningful change (Sorkin et al., 2021; U.S. House Judiciary, 2021). In the future, approaches should more meaningfully engage the frame of political economy as it helps us critically interrogate how government agencies or public officials enact law, as another component of a complex sociotechnical ecosystem that bounds mis- and dis-information phenomena.

3. CONCEPTUAL INTERVENTION: OUR PRIORITIZED APPROACH TO MIS- AND DISINFORMATION

Our review of the literature suggests benefit in using overlapping critical, cultural, and political economic lenses that attend to the co-constitutive nature among components of sociotechnical systems and agents to examine and articulate the multifaceted problems of and potential solutions to mis- and disinformation. To do this effectively we draw from science and technology studies' subfield social shaping of technology (SST) and critical informatics (CI), a growing subdiscipline in information fields.

SST argues that technology and meaning-making are enacted through various sites and practices of social interaction. As meaning and technology are configured socially, they may also be re-configured socially, as people mobilize to alter the social grounds on which technology is conceptualized and built and/or collective meaning-making take place (Barad, 2003; Wajcman, 2015). Some argue SST overemphasizes social concerns and places more agency with publics than warranted because this theory downplays the very real technological constraints that shape human dynamics in sociotechnical systems (Sawyer and Jarrahi, 2014). However, we contend that when coupled with CI's focus on power in design, and design as an ongoing process of societal dialectic, CI and SST can better chart how technical considerations and constraints shape and are shaped by the actors in design, development, deployment, and use, allowing us to better situate and attend to sociotechnical problems, within entirely alterable configurations of social power among an increasingly savvy public. Thus we engage in a multi-faceted approach to examine, identify and respond to the various problems of false and misleading information in contemporary society, highlighting and empowering agency of agents and collective publics to push back around perceived injustices in sociotechnical systems (Costanza-Chock, 2020; Feenberg, 2014).

CI draws from black feminist social epistemology, cultural studies, and neo-marxist critical theory to focus squarely on systems and practices of power and oppression in technical function of information systems (Day, 2007; Noble, 2016, 2018; Sweeney & Brock, 2014). By understanding complex technical phenomena in the context of social and structural power, we see more clearly the avenues to build power in groups most affected by mis- and disinformation to push for increased agency in shaping sociotechnical spheres. Paris, Reynolds & McGowan's (2021) critical informatics interpretation of Feenberg's (2017a) "conscious co-production" (p. 11) highlights those ordinary, non-expert users can influence the social codes and designs that define users' roles within technological practice in ways that encourage users to develop a practical technical knowledge and avenues to express it (p. 3). This knowledge and attendant practices can be cultivated to influence technological development, which might be thoughtfully guided to promote more ethical and equitable sociotechnical relationships (p. 3).

We have found Milner and Phillips' (2020) ecological literacy has been a particularly fruitful advance in scholarship to help more clearly articulate the complexity of systems, forces, and factors at play. Engaging meaningfully with complexity requires the cultivation of interlocutors' sociological imagination, and capacity to think about sociotechnical systems by disentangling their components. Our approach aims to contextualize mis- and dis-information as situated in an ecosystem of interdependent sociotechnical forces, emphasizing how structural power operates plays a crucial part in the project of understanding mis -and disinformation within sociotechnical systems.

3.1 Plans for testing the conceptual intervention

To test the practical application of such conceptual grounding to understand mis- and disinformation, the authors took an opportunity offered by our home university to develop a 15-week university-wide, undergraduate course with multiple sections to address what university-level curriculum administrators see as a generational problem of false and misleading information requiring literacy solutions (Paris et al., 2022). While the invitation to produce such a curriculum likely rests on assumptions of individual responsibility for systemic problems, and posits "literacy" as a possible "solution", our responding work builds on the rationale set out above. We plan to engage in a research program around the course curriculum development and its implementation to inform our ongoing refinements and improvements of the course's ability to resonate with students, the grade level appropriateness of readings and

assignment, and potential development of an instructional tool kit containing guided discussion question prompts and activity scaffolds to share widely (Paris et al, 2022).

4. CONCLUSION

In this exercise of zooming out, way out (per Milner & Phillips, 2020), we build upon research into information practices that is critical (Tewell, 2015), invested in the sociomaterial realms (Schatzki et al., 2001; Sawyer and Jarrahi, 2014), focusing intently on SST and CI approaches to allow deeper engagement with the complex inter-relationships among the actors and forces that shape sociotechnical systems, with an eye towards the role of structural power and ideological forces. Our “locus of change” conceptualization is a unique contribution that we hope will be useful to the information science and technology research community, for instance in technical, policy, and radical activist research and action, against false and misleading information spread. We aim for this work to facilitate understanding among community actors (through student education for instance), through growing awareness of sociotechnical interdependencies, and through engaged dialogue and communication respecting varying ideological frames, of the need for alternative new and contrasting social configurations. These might include publicly-constituted information and data ethics oversight boards for instance, that facilitate more empowered roles of publics in responsibly regulating information practices of institutions, governments, municipalities, etc. in the shared public interest. .

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