

Making the invisible visible: Critical discourse analysis as a tool for search engine research

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Abstract

Like information science more broadly, search engine research has largely been fragmented into two factions: system-oriented and user-oriented studies. This limits our capacity for answering some fundamental questions surrounding an integral—often invisible—part of modern life. Given the “search-ification” of this life, given an oligopolous global market and an information-wealthy but attention-poor audience, methods capable of studying search engines, as well as their relationship with users and society are increasingly necessary. This paper proposes critical discourse analysis (CDA) as an effectual, oft-overlooked method for search engine research, one capable of interrogating both search engines and their use. The paper outlines CDA, provides examples of its application, and highlights its capacity for progressing our critical understanding of search engines. This developing understanding, evidenced by a review of the literature, suggests that challenges brought by search cannot be resolved by critiquing the power of systems alone. Rather, a reclaiming of today's information infrastructure requires we also illuminate the socio-political environments of search systems, and the metacognitive, invisible processes pivotal to our communication with them. While power-analyses of search continue, and some have begun to employ CDA, little recognition exists of this theoretical perspective's capacity for supporting both system-oriented and user-oriented studies.

1 | INTRODUCTION

In his seminal work, Belkin (1978) explains “any information concept for information science must be able to account for information [...] as a social communication process” (p. 60). Brookes (1980) adds, information science has “a special responsibility to clarify [...] interactions between mental and physical processes or between subjective and objective modes of thought” (p. 126). Such

demands are more important than ever given today's increasingly invisible information infrastructures where the lines between mental and physical processes, and between subjective and objective modes of thought are blurred. Our manners of interacting with information, moreover, including voice-based input and output, increasingly reflect traditional forms of social communication (Vtyurina & Fourney, 2018). This, coupled with the contemporary co-constructed nature of

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information, information systems and users, necessitate a return to the “big questions” asked in information science (Bates, 1999, p. 1048):

1. The physical question: What are the features and laws of the recorded-information universe?;
2. The social question: How do people relate to, seek, and use information?; and
3. The design question: How can access to recorded information be made most rapid and effective?

The emergence of the web did not necessarily change these questions, but the explosion of information it brought, and the manners used by search engines to curate it, mean the answers are linked in ways, and at a scale, not seen previously. Calls for further critical approaches to search engine research reflect this and respond to the now-normalized reliance upon online search, and a market dominated by very few players with “very low quality thresholds” (Lewandowski et al., 2022). This information ecosystem means some additional questions relating to power are beginning to be raised in search engine research (e.g. Boyd et al., 2014; Gillespie, 2017; Haider & Sundin, 2019; Halavais, 2009; Lewandowski, 2017; Rieh et al., 2016; Selwyn, 2010; Vaidhyathan, 2011).

Some of these relate to:

- Search engines' influence on how information is interpreted and valued;
- The opacity of algorithms which can privilege or suppress certain discourses;
- The dominant, typically commercial, ideologies inherent in these algorithms;
- The new literacies required to recognize and navigate same;
- The dangers of taken-for-granted “traffic commodity” and “service-for-profile” models; and
- The rise of a global discourse and the social actors influencing it.

Despite growing acknowledgement that power relations affect both search behavior and search systems and that these “cannot meaningfully be thought of as distinct,” to date much search engine research continues to be fragmented (Haider & Sundin, 2019, p. 72). This paper seeks to begin addressing this fragmentation proposing a methodological approach capable of denaturalizing *both* search systems and search behavior. Specifically, it argues that Fairclough's model for critical discourse analysis (CDA) can expand the means for explicitly interrogating the socio-technical aspects of search. Information science has typically paid less attention to these aspects and is also yet to capitalize on the benefits of

centralizing discourse in its investigations of search. This is somewhat surprising. Discourse is the primary mediational tool through which search systems shape information, and ultimately, our lives, and the primary tool with which users, in turn, interact with, and promote such shaping. In this way, discursive analyses are able to at once elucidate “information as content and information as emergent in practice,” a constitutive entanglement that must be foregrounded if we are to better understand search (Haider & Sundin, 2019, p. 93). A critical framework, moreover, such as that proposed here, can help expose the social determinants and effects of certain discourses being privileged by systems and users alike.

CDA is an interdisciplinary theory combining linguistic examination with social theory to denaturalize language practices (Rogers, 2002). Like all discourse analysis, CDA sees “linguistic practices as not simply reflecting underlying [...] social realities but as constructing and legitimising” them (Coyle, 2000, p. 57). Its critical grounding means CDA is particularly interested in hegemonic ideologies and inequitable distributions of power which are naturalized or hidden by language. CDA is thus highly suitable for search engine research. While users can, and often do, benefit from the ubiquitous, near-instantaneous and free information search engines distribute, the search companies benefit more. Put curtly, there exists an undeniable, power imbalance between search engines and their users—users who themselves continue to legitimize the disproportionate power afforded these digital juggernauts, largely through discourse (Mager, 2012; Morrison, 2020, 2022). Search engines are also capable of promoting, or disrupting, existing social inequities beyond the digital realm (Baker & Potts, 2013; Noble, 2012, 2018). CDA as a model for conceptualizing search engines, as well as our interactions with them, enables greater understanding of this reciprocal, invisible, often problematic, relationship between cultural knowledge and digital structures. Indeed, as further detailed below, CDA's flexibility enables the physical, social, and design aspects of search to each equally be analyzed, at once broadening and uniting the methodological approaches for understanding system and user.

The purpose of this article is to increase recognition of CDA as a method for search engine research, one capable of denaturalizing both search systems and search behavior, and for helping to answer information science's big questions. It proceeds as follows. First, I review some key literature responsible for developing our understanding of search practices as social practices, and for advancing the legitimacy of critical studies of commercial search engines specifically. This review traces the development of using power analyses in the study of search engines and identifies some existing limitations that CDA can begin to redress. Next, I identify the value of discursive approaches

to search engine research and reflect upon some recent findings. Fairclough's three-tiered model for CDA is then introduced, including description of how each tier enables greater understanding of search engines, their users and of the "space between them." Next two example studies are presented, illustrating possible application of CDA and how its methodological flexibility can facilitate both user-oriented and system-oriented research toward a more complete understanding of search engines. The paper closes by returning to Bates's (1999) three "big questions" for information science, highlighting CDA's unique capacity for addressing all three.

1.1 | Critical approaches to search engine research

Information Science has been studying computerized search systems since the 1940s, but the need to interrogate search from a critical lens has only been established more recently (Haider & Sundin, 2019). Critical theorists begin with the assumption that "injustice and oppression shape the social world" (Rogers et al., 2005, p. 367) and seek to change society by understanding and redressing these factors as well as the social structures normalizing them. According to Rogers et al. (2005, p. 368), critical theorists argue that

thought is mediated by historically constituted power relations. Facts are never neutral and are always embedded in contexts. Some groups in society are privileged over others and this privilege leads to differential access to services, good and outcomes. [...] Another shared assumption is that one of the most powerful forms of oppression is internalized hegemony (Gramsci, 1973; Ives, 2004).

This section reflects on some key works which laid the groundwork for using critical analyses in the study of search.

In his 2006 manifesto, Vaidhyanathan uses the term critical information studies (CIS) to categorize what was an emerging field at the time. This—urgently needed—field, he explains, "interrogates the structures, functions, habits, norms, and practices that guide global flows of information [and] asks questions about access, costs, and chilling effects on, within, and among audiences" (p. 292). Like all research discussed here, Vaidhyanathan's work began problematizing the untold benefits that come with immediate, global, and limitless networked "knowledge" and with a resulting narrowing of attention.

As the search technology evolved, so too did the studies critiquing it, no longer just asking: "what are the costs and consequences of commercialising salience?" but "who is responsible?" and "what can be done?" Pasquale (2008, 2011, 2013) considers these questions in light of net-neutrality and America's antitrust laws, critiquing the legal system's role in keeping "knowledge" equal. His research traces the commercial and legal uncertainty surrounding search, as well as the dominant players' responses to it. Of Google's early advocacy for net neutrality, Pasquale (2008) predicted, in time, the company may be less interested in "keeping [telecommunication] carriers accountable, and more a beneficiary of the very discriminatory tactics they once decried" (p. 286). His work highlights threats to the economy, autonomy and democracy when gatekeepers operate under laws ill prepared for a global information ecosystem. Pasquale makes the provocative suggestion that, in lieu of adequate laws, we are responsible for how search engines run, pointing to a distinct lack of awareness and qualification. He questions "whether the uncoordinated preferences of millions of web users for low-cost convenience are likely to address the cultural and political concerns that dominant search engines raise" (p. 402). Addressing such concerns, Mulligan and Griffin (2018) later explain, begins in part with recognizing that common user conceptions of "Google search as a steward of knowledge [...] conflict with Google's understanding of its role as a mirror reflecting users interests" (p. 562).

Despite this conflict, in "Search Engine Society" Halavais (2018) asserts it is "our evolving ideas of what a search engine should do [that] shape its development" (p. 37) ultimately making "traditional assumptions of relevance obsolete" (p. 78). While not the first text on how to use search engines, his 2009 edition was certainly one of the first on how search engines use *us*. "Search Engine Society" sheds new light on the problematic power relations inherent in search, both between search engines and their users, and between *critical* users and those depending on "only the most easily found" discourses (p. 136). Halavais identifies search engines as more than instruments of international influence, nominating Google specifically as "the most powerful unobtrusive measure of collective and individual desires society has ever known" (2018, p. 211). This narrowing of attention upon Google, one later extended in the field, is unsurprising given its increasing near-monopoly, but reflects important shifts in our attempts to answer those questions "who is responsible?" and "what can be done?" Like Pasquale, Halavais suggests we should aim to better understand the engines trying to understand us, but in the "Googlisation of everything," published 4 years later, Vaidhyanathan concedes we must instead better understand ourselves.

Several social and historical contexts likely inspired this change including: growing public acquiescence to Google's control over our information; and diminishing power of laws governing its capacity to do so opaquely. Like Halavais, Vaidhyanathan denounces our blind faith in Google, demanding greater normative critique of a company no longer just helping people find information, but helping to navigate their lives. Vaidhyanathan implores further suspicion of a system commonly privileging "consumption over exploration, shopping over learning, and distracting over disturbing" (2011, p. 11). Though his text starts biblically with "in the beginning," the author leaves us with a Darwinian imperative, explaining the survival of our species depends upon us reclaiming control of society's most precious assets, including our attention. Like others (Halavais, 2009; Zimmer, 2008), Vaidhyanathan proposes a publicly funded alternate search system, one that expands opportunities for knowledge, but without the need for a "Faustian bargain" (Zimmer, 2008). His work on search bias, its origins and effects, helped set the stage for Noble's (2012, 2018) research on how Google's biases perpetuate particular stereotypes.

Though both Vaidhyanathan and Noble concur that Google's dominance amounts to a type of ideological imperialism, Noble might question the former's suggestion that search "refracts, more than reflects, what we think" (2011, p.7). Here, Noble aligns more with Halavais (2013) who identifies search engines' penchant for privileging finite sections of the web where the "rich get richer" and minorities are increasingly silenced. Noble builds upon these and other studies which denaturalize search, but is the first to employ CDA in doing so. Her ground-breaking dissertation (2012) and subsequent book (2020) present evidence that Google acts as curator and promoter of stereotyped racialized and gendered discourses, and traces the troubling human origins and effects. While Noble continues to problematize the power search engines wield in privileging certain discourses (Baker & Potts, 2013; Lewandowski, 2017), little research has investigated the day-to-day discursive practices of searchers affording Google and others this power (for exceptions, see Andersson, 2017; Haider & Sundin, 2019).

Morrison's (2020, 2022) work helps to address this gap, employing CDA to highlight how searchers' own discursive construction of search can be limiting, as well as complicit in sustaining Google's hegemonic power. Her work responds to calls—in lieu of greater algorithmic transparency—for greater understanding of our own search practices, and highlights the ongoing need for improved search literacy. Like Vaidhyanathan, Morrison (2020) problematizes the finding that searchers continue to "express deep satisfaction" with search engines despite a lack of such literacy and despite infrequent search

success (Vaidhyanathan, 2011, p. 60). The research extends dialogue regarding the symbiotic meaning-making between search engines and their users, but uniquely, proposes changing our own discursive practices as one way for challenging the problematic discourses search engines privilege. Like others (Haider & Sundin, 2019; Puschmann, 2019), Noble and Morrison progress the ongoing work it takes to denaturalize search and demonstrate CDA's utility in both system-orientated (Noble, 2012, 2018) and user-oriented research (Morrison, 2020, 2022). Together their work (discussed further later) re-highlights the benefits of centralizing discourse in researching today's information infrastructure.

1.2 | Discursive approaches to search engine research

Language remains the most influential meaning-making tool both in society and online (Fairclough, 2015). Discourse considers language a "social practice determined by social structures" (Fairclough, 2015, p. 51). Beyond just the spoken (talk) or printed product (text), discourse incorporates how these are produced and interpreted, how they reflect power relations, as well as the social determinants and effects of these. Analyzing "the space between" speakers and listeners and writers and readers—analyzing how talk and text are interpreted—can help reveal the invisible, internalized, but often socially produced assumptions surrounding online search, as well as the associated power relations and meanings made. Early work by Talja (1999) established discourse analysis as useful in information science for examining these "interpretive repertoires." Through a Foucauldian discourse analysis, she reveals that in communicating about, and with technology, we have no choice but to use "existing expressions and conceptualizations" which are loaded with implicit, often dubious, assumptions about information, and information seeking (Limberg et al., 2012, p. 112).

Studies of the links between talk specifically and technological practices are growing, particularly in education (Major et al., 2018). Within this field, some report a relationship between certain types of talk and online search. Knight and Mercer (2015) use sociocultural discourse analysis to research students' collaborative online search. They find that those experiencing the most search success participate in the most exploratory talk; talk involving critical and constructive engagement with each other's ideas. Similar discursive practices (building on one another's ideas and equal dialogic contributions) are also found by Castek et al. (2012) to assist collaborative search. The growing popularity of voice-based searches

has attracted discursive approaches be adopted more recently (Barko-Sherif et al., 2020; Guy, 2016). With the exception of Noble (2012, 2018) and Morrison (2020, 2022), however, few have applied CDA in investigating search engines and their use.

2 | FAIRCLOUGH'S MODEL FOR CDA

For Fairclough, any instance of discourse is “simultaneously a piece of text, an instance of discursive practice and an instance of social practice,” requiring three levels of analysis (1993, p. 4). He suggests that texts, be they spoken or printed, are more than a collection of linguistic features and reveal much about what individuals (and even, systems) take for granted, including certain knowledge, beliefs, and values. These internalized common-sense assumptions, what Fairclough (1993) calls “members’ resources,” are socially constrained and constitutive and influence how discursive and social practices are interpreted, often unconsciously, even by their creator. Fairclough’s model can assist in providing tools (Figure 1) to illuminate how texts are produced, how they are interpreted and the “members’ resources” upon which this interpretation relies, as well as the social conditions making these resources available or privileged.

One of the chief benefits of employing Fairclough’s model is its flexibility. The model provides a lens and an apparatus that can be used by both information retrieval researchers and those researching information behavior. What is more, information infrastructures like search engines, where the

system and searchers’ interactions with them are mutually shaping, lend themselves to Faircloughian analyses given discursive practices and social practices (like search), and the common-sense assumptions underpinning them, are understood as socially constrained and constitutive.

Researchers are not limited by what they put forward as “text” to be analyzed in applying the above. That is, while particular printed (i.e. a website) or spoken (i.e. a librarian’s verbal instruction) products might appear the obvious choice as empirical materials to be analyzed as “text,” the model can be applied with different levels of granularity. The “text” to be analyzed could be: a single search query; a search query log collected of certain groups or certain periods; a single utterance during a collaborative search or during an interview with search engine optimization (SEO) personnel; a search engine results page (SERP); or larger collections like marketing materials for search engine companies. This list is not exhaustive but illustrates the capacity for CDA to broaden our understanding of search engines and their use. Indeed, part of the proposed model’s strength is that, irrespective of what “text” is to be analyzed (micro), the analysis is premised upon identifying and critiquing the relationship the text has with broader discursive (meso) and social (macro) conditions. The same model, moreover, can be used concurrently to study, as text, both facets of search systems and our uses of it. In this way, CDA can assist in jointly addressing the seemingly disparate “big questions” of information science relating to search engines (physical, social, and design questions). The following sections describe the micro, meso, and macro-levels of Fairclough’s model, presenting indicative examples for each. While the levels are described separately here, in reality CDA involves an iterative process between all three.

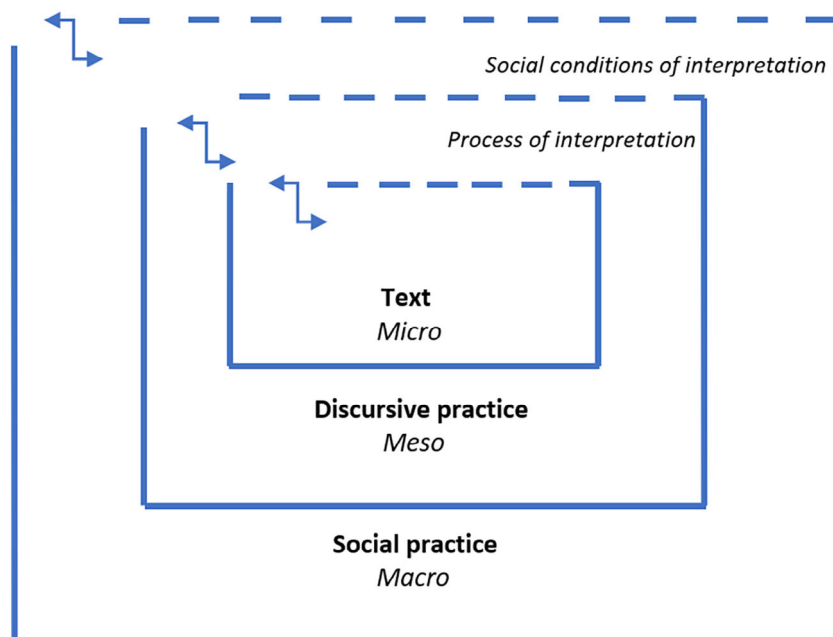


FIGURE 1 Proposed model for search engine research. Adapted from Fairclough (1993, p. 73).

2.1 | Micro-analyses in proposed model

The central tier in the proposed model (Figure 1) represents the micro-level of analysis where texts are treated independently and scrutinized for their linguistic and formal features. Micro-analyses are highly sensitive to language nuances with consideration given to chosen features including vocabulary, grammar, and textual structure.

To illustrate, take the (now-customary) spoken utterance “*Just Google it*” as a text. Micro-analyses would identify the utterance to be active, agentless and imperative in nature, for example, and would interrogate the influence of each on meaning made. Choice of the terms “Just,” “Google,” and “it” can also be analyzed. While “just” can be used colloquially, here it appears to demonstrate the “depreciatory just” (Wiegand, 2016), used to minimize a process’ significance (Lee, 1987, p. 378). In this phrase, “just” minimizes the perceived difficulty of, or time involved in search. Reference to “Google” as opposed to perhaps, “search” reflects familiarity—the type of brand generification most companies only dream of (Ma, 2014). Use of the pronoun “it,” in place of whatever is being searched for is also telling. Reference to this singular pronoun instead of a presumed antecedent again minimizes the process, reducing search to something involving a *singular* response or solution.

Such analysis is of course incomplete. Analyzing the manner in which texts are produced and interpreted at the meso-level; analyzing texts as *discursive practice*; is more informative. Indeed, the value of the “textual features [described at the micro-level] only become real, socially operative if they are embedded in social interaction” (Fairclough, 2015, p.154).

2.2 | Meso-analyses in proposed model

Meso-analysis in Fairclough’s model considers such social interaction. It sees a text’s value and meaning as being “generated through a combination of what is in the text and what is ‘in’ the interpreter” (Fairclough, 2015, p. 155). In Meso-analyses, the largely invisible, interpretive tools one uses to understand their search and discursive practices, one’s “members’ resources,” are considered. These interpretive tools typically draw upon a limited set of normalized discursive practices, often the same practices which helped govern the text’s production. Thus, in our earlier example, the suggestion to “*Just Google it*” is only appreciated because of shared understandings. This brings to bear a central tenet in information science, the concept of relevance. Saracevic (2009) explains “relevance is a human notion” (p. 2575), but its measurement differs between system-oriented and user-oriented

studies. For the latter, “relevance is seen as it is understood by the user. [...] It is deeply situated and depends on human judgement (Haider & Sundin, 2019, p. 8). For system-oriented studies, relevance instead measures “the relation between the content of the document and the system’s search criteria” (Cosijn, 2010, p. 4512). With commercial search engines of course, these criteria are in part, perhaps predominantly, based upon human judgement (Lewandowski, 2017). In this way, it could be suggested that Google (and other search engines) have their *own* “member’s resources” and that these resources are frequently similar to those users hold. Such a suggestion becomes all the more germane with regard to personalized algorithms. While much excellent work has been done on these, on filter bubbles and even upon a third, social, measure of relevance (Haider & Sundin, 2019; Kliman-Silver et al., 2015; Pariser, 2011), analyses at the meso-level of Fairclough’s CDA could advance our understanding of relevance, as well as its algorithmic and social origins and effects.

Meso-analyses are concerned not with the properties of texts, but with the processes of their interpretation. Like all information science research, it is interested in how these processes assist or impede communication—including communication with search engines. In 2013, Baker and Potts investigated Google’s auto-completion algorithms to consider how a search engine *interprets* user queries. Reminiscent of the work by Noble (2012), the researchers analyze more than 2500 search “stems” and the resultant predictive text, highlighting how Google interprets certain searches in ways reflecting and reproducing stereotyped views. The stem “Why do gay” for example returned the following top predictions: “Why do gay men have high voices”; “Why do gay men get aids”; and “Why do gay people talk funny.” The authors lament, “humans may have already shaped the Internet in their image” (Baker & Potts, 2013, p. 201). While this powerful study answers some unsettling questions, in addition to raising others, continuing to locate search and search practices within broader ideological structures, employing CDA could have extended the work in several ways.

First, CDA provides a meta-language with which to discuss the invisible “space between” the text typed by users and that predicted by Google (e.g. *interpretation/members’ resources/social orders*). Meso-analyses guided by the proposed model could also strengthen the validity of findings. Consider Baker and Potts’ coding of particular questions as being positive or negative. “Why do black men cheat” is coded as negative for example (Baker & Potts, 2013). While the researchers *mention* the invisible assumptions this coding relies upon, the identification and discussion of these is missing, as is discussion of the broader structures privileging them. Interrogation of

the word “cheat” for example, in line with CDA, would help expose the researchers' own process of interpretation. Discussing the term's link with institutionalized (legal and religious), western values of monogamy would assist, not only by highlighting the researchers' positionality, but by strengthening claims made about Google's stereotypical interpretations.

According to Fairclough (2015), discourse analysts “cannot directly extrapolate from the [micro] formal features of a text to the [...] structural effects upon the [macro] constitution of society” (p. 154). Instead, social actors, both in producing and consuming texts, mediate this gap materializing discourses and the ideas they present (Morrison, 2020). This is the work of the meso-level. Some actors, like Google, experience the power to privilege certain discourses while delegitimising others (Lewandowski, 2017; Noble, 2012, 2018). Employing CDA would have required Baker and Potts (2013) to discuss the nature of Google's power, granted partially by the digital oligopoly dominating the global economy (Haider & Sundin, 2019), and to problematize the link between this power, Google's self-interests and the discursive power it holds (Lewandowski et al., 2020; Mulligan & Griffin, 2018).

2.3 | Macro-analyses: Completing the model

Macro-analyses consider the wider “social formations, institutions, and power relations that [...] texts index and construct” (Luke, 2002, p.100). Rather than focusing on specific texts (micro) or specific discursive practices (meso), macro-analyses treat these collectively as evidence of wider social phenomena. This section discusses the types of analyses that can occur at this level, in addition to the micro and meso-levels, bringing together an understanding of the proposed model for CDA.

The illustrative text will be the “*I'm feeling lucky*” tab, one of few features on Google's otherwise blank interface. This tab allows “lucky” users to go straight to sites the search engine deems relevant. Micro-analyses would identify the tab's phrasing as active, declarative, and as employing contraction for informality, and discuss the influence of each on meaning made. Meso-analyses—interested in the interaction between communicators—might draw attention to the use of “*T*” here and its effect of somewhat removing Google from the interaction. Such invisibility has been discussed in depth elsewhere, albeit not using CDA nor this particular Google function (Haider & Sundin, 2019; Hillis et al., 2013; Lewandowski, 2015). Also of note, and worthy of further meso-analyses, is the assumption that users will understand they hold the

position of “*T*” on this landing page, but “*you*”—as in “did you mean”—on subsequent SERP pages. Meso-analyses might consider the implied *interpretation* that actively and carefully selecting websites based on need makes one “unlucky.” Google appears to interpret (or presumes users will interpret) “easy” digital practices positively, discouraging any extended effort on the searcher's behalf (Sun et al., 2014). Users appear to be interpreted here as unskilled and inactive—as perhaps needing luck to succeed. Such passivity has been reported before, even by searchers themselves who otherwise designate their role as active during alternate digital tasks (Morrison & Barton, 2018). Admittedly, algorithmic advances do mean search engines are getting better at guessing what we want (or *think* we want, Vaidhyathan, 2011), but this further diminishes searcher control.

Such power relations and the ideologies and structures which depend upon them are the consideration of macro-analyses. A complete discussion of all contexts surrounding Google is clearly impossible. This section instead identifies some of the wider structures which could inform a macro-analysis of its “*I'm feeling lucky*” tab. First, to the commercial promotion of ease. Mager (2012) suggests search engines are “stabilized in [contemporary society's] new spirit of capitalism” (p. 782), including new forms of commodification, like the commodification of our attention (Goldhaber, 1997; Sweeney & Brock, 2014). Much has been made of supposed cognitive reductions and perpetual laziness caused by new digital habits (Carr, 2010; Sparrow et al., 2011). Irrespective of the validity of such claims, the world's most powerful—and visible—companies (Amazon, Apple, Facebook, and Microsoft) continue to promote certain practices (Lewandowski et al., 2020) that naturalize the value of all things “easy.” The rapid uptake of ChatGPT and other AI-powered text creators further attest to the seductive nature of more effortless digital practices, and help to illuminate the long-standing benefits of critiquing not only digital behaviors, but the ideologies underpinning them. A macro-analysis using the proposed model would demand we interrogate our desire for convenience over all else, as well as its origins and effects (Mager, 2012). Exploring features like the “*I'm feeling lucky*” tab through such a critical lens can broaden our understanding of Google's influence, including how it influences what we perceive of, and value as, information.

Historically it has been education—and schools specifically—that were the foundation for determining what serves as information and as knowledge worth having. Thus, a consideration of how this formal structure endorses search engine use could also inform a macro-level analysis. Online search remains one of the most prolific internet activities conducted in schools today (Fraillon et al., 2019; Vanderschantz & Hinze, 2019).

Much literature reports, however, that teachers continue to search, and encourage students to search in limited (lucky?) ways, like looking for singular, positivist answers (Andersson, 2017; Gärdén et al., 2014; Morrison, 2020, 2022). Macro-analyses might link such practice to the return of standardized tests in schools in many countries; tests said to promote de-contextualized answers (Australian Primary Principals Association, 2010). Literature provides evidence that the more “epistemologically advanced” a teacher’s beliefs about the net, the better their search outcomes (Tsai et al., 2011). In addition, student search outcomes are affected by the adult guidance (Gossen et al., 2014; Madden et al., 2006) and instruction received (Bilal & Gwizdka, 2018; Huertas-Bustos et al., 2018). A macro-analysis of Google’s functions can shed new light on such findings, illuminating the potential need for schools and teachers to be wary of Google’s “I’m feeling lucky” tab. Ultimately, the power of Google to influence how information and information retrieval are interpreted relies heavily upon institutions like schools continuing to legitimize the site and its increasingly invisible (as well as visible) functions.

3 | EARLY WORK: CDA IN SEARCH ENGINE RESEARCH

Having established the various analyses that can occur at each tier of the proposed model, this section considers two fuller applications of CDA in search engine research to demonstrate its flexibility. The first study (Noble, 2012) investigates how Google privileges certain discriminatory discourses. The second instead explores how searchers’ own discursive practices privilege Google and those seemingly proficient in using it (Morrison, 2020). These studies highlight the centrality of discourse in continuing to denaturalize search, and help demonstrate CDA’s utility in both system-orientated (Noble, 2012) and user-oriented research (Morrison, 2020).

3.1 | Study 1: Noble (2012)

In her study of how Black women and girls are represented on the first page of Google search results, Noble (2012) presents evidence that its algorithms foster dominant, typically damaging stereotypes. Situated within CIS and critical race studies, the study discusses the likely causes, as well as implications, when Google’s first SERP fosters discourses that “reinforce oppressive social relations” (2012, p. iii). Employing both content analysis and CDA, the researcher powerfully reminds us that “Google’s search technology is situated in a range of cultural

contexts that include patriarchy, and the devaluation and historical subjugation of Black people, namely, Black women” (pp. 111–112). Data-wise, Noble uses the URLs, site titles and two-sentence descriptors for each result on the first SERP returned when queries of intersecting racial and gendered identities (e.g. Black girls; White women) are entered in Google. These are then coded using content analysis, as are the advertisements returned.

While her use of content analysis assists at the micro-level (i.e. in identifying the textual features of the above), Noble justifies the need to also employ CDA explaining that a:

critical view on ideology is a fundamental part of understanding how to evaluate texts *beyond* the descriptive content analysis methods that [...] fall short of being contextualized in terms of power or domination (p. 111, italics added).

Like Halavais (2009) and later Lewandowski (2017), Noble identifies Google’s algorithmic interpretations as being inherently human, and capitalistic in nature, highlighting the increased potential for harm given the company’s near-market monopoly. The study finds that, unlike “men” and “white women,” Google’s results almost universally commodify Black women, also reporting all advertising surrounding Black girls to be “hypersexualized and pornographic” (Noble, 2012, p. 117).

Part of Noble’s micro-analysis includes presenting counts of the terms appearing in the first result’s text when “Black Girls” is searched. If we discount the term “black” itself, the derogatory metaphor “pussy” appears four times more than any other term. Utilizing CDA, the researcher successfully illuminates the link between these trends and the commodified value of certain identities that Google brokers. In CDA terms, Noble thus demonstrates the relationship between the micro (text in SERPs) and the meso (privileged interpretations from which these texts draw). Using data from Google AdWords Keyword estimator, she demonstrates how Google makes more money from clicks on ads for “Black girls/women” than any other query. In short, it benefits Google to interpret queries in this way. Noble even presents evidence that some sites not containing content related to “Black girls/women” include these terms in their descriptors to attract more traffic. This helps further illuminate just how privileged these sexualized interpretations are; privileging that extends beyond Google’s algorithms.

As such, and in line with the proposed model, Noble (2012) situates these findings within broader (macro) structures, including the economy. She successfully ties

the online commercialization and sexualization of Black girls to socio-historic conditions including: a legacy of white domination; the leveraging of women as pornographic objects; and the normalization of rape in patriarchies. The still precarious status of women across much of modern America is also discussed, locating the “legitimation” of this biased representation within wider contemporary practices. Importantly, Noble uses CDA to highlight the social risks inherent when Google mediates information in this way. She asks “who owns identity and identity markers in cyberspace,” problematizing the likely answer (i.e. Google) and the level of authority increasingly conferred upon search engines by various institutions including schools, law and government (2012, p.133).

Through CDA, Noble (2012) is able to critically interrogate how online manifestations of race and gender are produced on SERPs, how they are interpreted, and the “members’ resources” upon which this interpretation relies. In comparing these findings to *offline* historical and social constructions, the study illuminates the conditions making these “members’ resources” privileged, to users and search engines alike, as well as the intricate and invisible relationships between them.

3.2 | Study 2: Morrison (2020)

While Noble problematizes the power search engines wield in privileging certain discourses, Morrison’s work investigates some of the day-to-day discursive practices affording these systems such power. In her 2020 study, she critiques the way online search is discursively constructed by Australian home-schoolers. The study responds to evidence that online search is one of the most prolific internet activities conducted (in schools and in home-schools), to repeated reports of search-skill deficits among students, and to preliminary reports of a relationship between discursive practice and search practice. Specifically, Morrison explores the value of the generational digital divide (GDD) construct in understanding the participants’ search and discursive practices. This construct suggests that those born after 1980 (Digital Natives) are inherently technologically superior to those “digital immigrants” born before (Prensky, 2001). Empirical materials including search practices and discursive practices were collected via survey, interview, observation, and test.

Guided by Fairclough (2015) and Talja (2005), the study explores search proficiency as a type of power, where proficiency—or the presumption of same—grants status, often through discourse. Morrison (2020) identifies the participants’ search and discursive practices (micro), and their interpretation (meso), as interrelated

social practices. Using CDA, these practices are theorized as depending upon, and reinforcing, invisible, (macro) ideologies which ultimately impede communication, both between users, and between user and search engine.

Morrison reports that an unrelenting faith in the GDD (in the superior skills of younger users), and in Google, presented in the participants’ discourse despite conflicting evidence. She locates this disproportionate faith within dominant ideologies of technology, childhood, and education. A brief example of CDA’s application in illuminating the power granted search engines is included below.

One way the participants’ discursive practice assigned power to search engines was by representing them as “animate beings.” Participants described search engines “saying,” “giving,” and “sharing” information, utilizing personification. Though likely an unconscious choice, representing search engines as capable of “human” action raises their status beyond an inanimate technology. This discursive practice of giving technology personal attributes has also been reported outside of home-education (Wegerif & Major, 2019). [Excerpt 1](#) presents an example of this, and of several other discursive practices which raise the status of search engines above users.

In lines 149 and 160, the parent-educator refers to a site “saying” things despite no speech function being operational. In line 161, the student replicates this discursive practice. Indeed, all participants discussed search engines in this way, reflecting a shared interpretation of them as animate conversationalists. The capacity for computers to participate in learning conversations has been researched since long before the Internet (Wegerif & Major, 2019; Weizenbaum, 1966), but the proliferation of voice-based searches will likely inspire contemporary investigation. Importantly, some warn that if students have similar “conversational interactions” with technology as those in traditional classrooms, including “initiation, response, evaluation” exchanges, new educational benefits are unlikely (Wegerif & Major, 2019). Note too, how the parent-educator above immediately trusts what the site “says” above her student’s recollection (line 160). She disagrees with the student’s suggestion, stating only that the search engine “didn’t say that” and by implication, anything different must be incorrect. Responding in this way, as opposed to perhaps “you didn’t read that” also helps illuminate the parent-educators’ interpretation of search engine use, where users are passive receivers of information, with the search engine assigned a more powerful position regarding “truth.” The parent-educators’ use of the “depreciatory just” in line 185, and her suggestion to “click on the top” result (line 189) also further demonstrate how power is discursively bestowed to the search engine and to “easy” uses of it.

Excerpt 1 Observation—Family D's search engine use.

148. Student D1 Wasn't it 1930s?
 149. Parent D Yeah, it became popular in the 1930s is what it said, didn't it?
 [...]
 158. Parent D that was a dance teacher
 159. Student D2 And she danced with Vernon Castle?
 160. Parent D Oh, it didn't say that.
 161. Student D1 It doesn't say that—Vernon Castle [INAUDIBLE]. Yeah
 [...]
 182. Student D2 How to do Fox—where is it?
 183. Parent D Could you just—
 184. Student D2 Oh
 185. Parent D —could it just be easy to say “how to Foxtrot”?
 186. Student D2 Ok.
 187. Parent D How to Foxtrot. So click on that.
 188. Student D2 [?I'll watch?] this one.
 189. Parent D OK. So click on the top one, How to Foxtrot

Morrison concludes by questioning suggestion that “an effective search engine is the necessity of today's information era” (Sharma & Sharma, 2013, p. 118). She instead suggests that the necessity is effective search engine *users* (OECD, 2016) and begins to demonstrate (2020, 2022) how discourse can both empower, or impede, such development.

4 | DISCUSSION

Few would deny the immense power that search engines have come to hold, not only influencing how we seek information, but how we interpret what information—and *valuable* information—is. This power is strengthened by the increasing invisibility of these systems (Haider & Sundin, 2019; Hillis et al., 2013). Such invisibility in part results from the ubiquitousness of online search, but it also emanates from equally invisible assumptions about: the reliability of search engines; their seemingly neutral purpose; and our “capacity” to control them. Heidegger's (1996) celebrated work explains that in using a hammer, “we forget the hammer itself as we are aware more of the task we are engaged in” (Wegerif & Major, 2019, p. 110). Kroksmark (2016) similarly suggests “the computer is to the pupil like the piano to the pianist. None of them think of the moments when the hands strike the keys” (p. 46). This article proposed CDA as both theory and method capable of illuminating the unseen inner-workings of search engines, as well as those of the users

so reliant upon them. It highlighted the benefits and flexibility of foregrounding discourse in studying search, as well as the inherent power relations involved. CDA by design illuminates opaque political and ideological structures (Wodak & Meyer, 2009), and can thus help “foreground culture as a sensitizing context for studying” search engines toward information science objectives (Sweeney & Brock, 2014, p.1).

In considering these objectives, including greater understanding of how information is manipulated and transmitted, structured, and evaluated, Bates (1999) presents three big questions:

1. The physical question: What are the features and laws of the recorded-information universe?;
2. The social question: How do people relate to, seek, and use information?; and
3. The design question: How can access to recorded information be made most rapid and effective? (p. 1048).

Information retrieval is uniquely positioned to examine the technical properties of search engines (questions 1 and 3), but it often ignores the invisible, cultural mediation, and impacts of, search engine use (question 2). Conversely, methods adopted by information behavior researchers often limit the possibility to map and measure search system's structure and processes (question 1). Today's information infrastructure is increasingly “entangled across culture and its practices” (Haider & Sundin, 2019, p. 2). Thus it is

imperative that search engines be investigated for their structural properties as well as their social and cultural influences (Halavais, 2009; Sundin et al., 2017), influences largely manifest in discourse.

As illustrated, CDA's flexibility enables the physical (see study 1), social (see study 2), and design aspects (see "I'm feeling lucky") of search to each equally be analyzed as "text," at once broadening and uniting the methodological approaches for understanding system and user. Such a consolidated approach supports Sweeney and Brock's (2014) suggestion that "[h]ardware, software, content, user practices, and interpretation, are all the outcome of complex social processes shaped by broader cultural values and ideologies" (p. 4).

Though CDA can be criticized for its laborious nature, as Saracevic explains, information science has always "involved a number of complexities," including linguistic ones, "requiring different solutions" (p. 2574). Others might suggest CDA is restricted in its capacity for studying bibliometrics, or for reporting statistical distributions and properties. On the contrary, any such analysis is dependent upon interpretation—if only that of the researchers—and can be strengthened by illuminating these processes. Fairclough's model for CDA gives researchers the tools to explicitly identify how certain assumptions and their ideological properties are drawn upon in the interpretation of results. Illuminating these processes can support both system-oriented and user-oriented studies. Bringing together different information science approaches means the complexity of search engines can be investigated from multiple perspectives, in turn expanding our collective expertise, while redressing any distinctive limitations.

5 | CONCLUSION

Despite notable developments in interrogating online search as social practice, Haider and Sundin (2019) identify a persistent gap in information science as to the political and socioeconomic aspects of search. This conceptual paper identified the capacity for CDA to continue addressing this gap by expanding both the type of research questions the field can ask, and the methods available for attending to them. I demonstrated how studies employing CDA can help illuminate the increasingly invisible normative practice of search, the hegemonic power relations involved, as well as the social and digital structures relying upon them being maintained. My extensive outline of Fairclough's model shows how CDA can help expose the social determinants and effects of discourses being privileged by systems and users alike. While some have begun employing CDA, to date little recognition exists of its

capacity for supporting both system-oriented and user-oriented studies, and for answering information science's big questions. It is hoped that future research will validate the claims made here by using CDA to continue the work required to denaturalize search and search engines.

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REFERENCES

- Andersson, C. (2017). The front and backstage: Pupils' information activities in secondary school. *Information Research*, 22(1) CoLIS paper 1604##. <http://InformationR.net/ir/22-1/colis/colis1604.html>
- Australian Primary Principals Association. (2010). *The reporting and use of NAPLAN*. http://www.appa.asn.au/images/news2010/paper_naplanreportinganduse20100611.pdf
- Baker, P., & Potts, A. (2013). 'Why do white people have thin lips?' Google and the perpetuation of stereotypes via auto-complete search forms. *Critical Discourse Studies*, 10(2), 187–204.
- Barko-Sherif, S., Elsweller, D., & Harvey, M. (2020). Conversational agents for recipe recommendation. In *Proceedings of the 2020 conference on human information interaction and retrieval (CHIIR '20)* (pp. 73–82). Association for Computing Machinery.
- Bates, M. (1999). The invisible substrate of information science. *Journal of the American Society for Information Science*, 50(12), 1043–1050.
- Belkin, N. (1978). Information concepts for information science. *Journal of Documentation*, 34(1), 55–85.
- Bilal, D., & Gwizdka, J. (2018). Children's query types and reformulations in Google search. *Information Processing and Management*, 54(6), 1022–1041.
- Boyd, D., Levy, K., & Marwick, A. (2014). The networked nature of algorithmic discrimination. *Data and Discrimination: Collected Essays*. Open Technology Institute.
- Brookes, B. (1980). The foundations of information science. Part I. Philosophical aspects. *Journal of Information Science*, 2, 125–133.
- Carr, N. (2010). *The shallows: How the internet is changing the way we think, read and remember*. Atlantic Books.
- Castek, J., Coiro, J., Guzniczak, L., & Bradshaw, C. (2012). Examining peer collaboration in online inquiry. *The Educational Forum*, 76(4), 479–496.
- Cosijn, E. (2010). Relevance judgements and measurements. In M. Bates & M. N. Maack (Eds.), *Encyclopedia of library and information science* (3rd ed., pp. 4512–4519). Taylor and Francis.
- Coyle, A. (2000). Discourse analysis. In G. Breakwell, S. Hammond, & C. Fife-Schaw (Eds.), *Research methods in psychology* (pp. 250–268). SAGE Publications Ltd.
- Fairclough, N. (1993). *Discourse and social change*. Policy Press.
- Fairclough, N. (2015). *Language and power* (3rd ed.). Routledge.

- Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Duckworth, D. (2019). *Preparing for life in a digital world: IEA international computer and information literacy study 2018 international report*. International Association for the Evaluation of Educational Achievement (IEA).
- Gårdén, C., Francke, H., Lundh, A. H., & Limberg, L. (2014, September). A matter of facts? Linguistic tools in the context of information seeking and use in schools. *Proceedings of ISIC: The Information Behaviour Conference, Leeds, Part 1* (paper isic07). <http://InformationR.net/ir/19-4/isic/isic07.html>
- Gillespie, T. (2017). Algorithmically recognizable: Santorum's Google problem, and Google's Santorum problem. *Information, Communication & Society*, 20(1), 63–80.
- Goldhaber, M. (1997). The attention economy and the net. *First Monday*, 2, 4–7.
- Gossen, T., Höbel, J., & Nürnberger, A. (2014, August). Usability and perception of young users and adults on targeted web search engines. *IIIx: Proceedings of the 5th Information Interaction in Context Symposium* (pp. 18–27).
- Gramsci, A. (1973). *Letters from the prison notebooks* (L. Lawner, Trans.). Harper & Rowe.
- Guy, I. (2016, July). Searching by talking: Analysis of voice queries on mobile web search. *Proceedings of the 39th International ACM SIGIR conference on Research and Development in Information Retrieval*, 35–44.
- Haider, J., & Sundin, O. (2019). *Invisible search and online search: The ubiquity of search in everyday life*. Routledge.
- Halavais, A. (2009). *Search engine society: Digital media and society series*. Polity Press.
- Halavais, A. (2013). Search and networked attention. In J. Hartley, J. Burgess, & A. Bruns (Eds.), *A companion to new media dynamics* (pp. 249–261). John Wiley & Sons. <http://ebookcentral.proquest.com>
- Halavais, A. (2018). *Search engine society*. (2nd ed.). Polity Press.
- Heidegger, M. (1996). *Being and time: a translation of Sein und Zeit*. SUNY Press, Albany.
- Hillis, K., Petit, M., & Jarrett, K. (2013). *Google and the culture of search*. Routledge.
- Huertas-Bustos, A., López-Vargas, O., & Sanabria-Rodríguez, L. (2018). Effect of a metacognitive scaffolding on information web search. *The Electronic Journal of e-Learning*, 16(2), 91–106.
- Ives, P. (2004). *Gramsci's politics of language: Engaging the Bakhtin circle and the Frankfurt school*. University of Toronto Press.
- Kliman-Silver, C., Hannak, A., Lazer, D., Wilson, C., & Mislove, A. (2015). Location, location, location: The impact of geolocation on web search personalization. In *Proceedings of the 2015 internet measurement conference* (pp. 121–127). ACM.
- Knight, S., & Mercer, N. (2015). The role of exploratory talk in classroom search engine tasks. *Technology, Pedagogy and Education*, 24(3), 303–319. <https://doi.org/10.1080/1475939X.2014.931884>
- Kroksmark, T. (2016). The stretchiness of learning the digital mystery of learning in one-to-one environments in schools. *Education and Information Technologies*, 21, 35–52.
- Lee, D. (1987). The semantics of just. *Journal of Pragmatics*, 11, 377–398.
- Lewandowski, D. (2015). Evaluating the retrieval effectiveness of web search engines using a representative query sample. *Journal of the Association for Information Science and Technology*, 66(9), 1763–1775.
- Lewandowski, D. (2017). Is Google responsible for providing fair and unbiased results? In L. Floridi & M. Taddeo (Eds.), *The responsibilities of online service providers* (pp. 61–77). Springer. https://doi.org/10.1007/978-3-319-47852-4_4
- Lewandowski, D., Haider, J., & Sundin, O. (2022). Call for papers: JASIST special issue on “Re-orienting Search Engine Research in Information Science”. *Journal of the Association for Information Science and Technology*.
- Lewandowski, D., Sünkler, S., & Schultheiß, S. (2020). Studies on search: Designing meaningful IIR studies on commercial search engines. *Datenbank-Spektrum*, 20(1), 5–15.
- Limberg, L., Sundin, O., & Talja, S. (2012). Three theoretical perspectives on information literacy. *Human IT*, 11(2), 93–130.
- Luke, A. (2002). Beyond science and ideology critique: Developments in critical discourse analysis. *Annual Review of Applied Linguistics*, 22, 96–110.
- Ma, W. (2014, June 30). The curse of generification for brands such as band-aid, hoover, Google, Xerox and escalator. *News.com.au*. <http://www.news.com.au/finance/business/the-curse-of-generification-for-brands-such-as-bandaid-hoover-google-xerox-and-escalator/news-story/e0f648fa32d7e07e134d83f889cbf643>
- Madden, A. D., Ford, N. J., Miller, D., & Levy, P. (2006). Children's use of the internet for information-seeking: What strategies do they use, and what factors affect their performance? *Journal of Documentation*, 62(6), 744–761.
- Mager, A. (2012). Algorithmic ideology. *Information, Communication & Society*, 15(5), 769–787. <https://doi.org/10.1080/1369118X.2012.676056>
- Major, L., Warwick, P., Rasmussen, I., Ludwigsen, S., & Cook, V. (2018). Classroom dialogue and digital technologies: A scoping review. *Education and Information Technologies*, 23(5), 995–2028.
- Morrison, R. (2020). *Search engine use in Australian home-schools: An exploration framed by the generational digital divide* (Doctoral dissertation). Griffith University. Griffith Research. <https://research-repository.griffith.edu.au/handle/10072/393191>
- Morrison, R. (2022). ‘Google Speak’: The discursive practices of search in home-education. *Dialogic Pedagogy: An International Online Journal*, 10, DT82–DT106.
- Morrison, R., & Barton, G. (2018). Search engine use as a literacy in the middle years: The need for explicit instruction and active learners. *Literacy Learning: The Middle Years*, 26(3), 37–47.
- Mulligan, D. K., & Griffin, D. S. (2018). Rescripting search to respect the right to truth. *Georgetown Law Technology Review*, 2(2), 557–584.
- Noble, S. (2012). *Searching for black girls: Old traditions in new media* (Doctoral dissertation), University of Illinois. ProQuest Dissertations Publishing. <https://www.ideals.illinois.edu/items/42263>
- Noble, S. (2018). *Algorithms of oppression*. New York University Press.
- Organisation for Economic Co-operation and Development (OECD). (2016). *Skills for a digital world*. [https://one.oecd.org/document/DSTI/ICCP/IIS\(2015\)10/REV2/en/pdf](https://one.oecd.org/document/DSTI/ICCP/IIS(2015)10/REV2/en/pdf)
- Pariser, E. (2011). *The filter bubble*. Penguin.
- Pasquale, F. (2008). Internet nondiscrimination principles: Commercial ethics for carriers and search engines. *The University of Chicago Legal Forum*, 263–301.
- Pasquale, F. A. (2011). Dominant search engines: an essential cultural & political facility. *The Next Digital Decade, Essays on the Future of the Internet*, 401.

- Pasquale, F. (2013). Paradoxes of digital antitrust: Why the FTC failed to explain its inaction on search bias. *Harvard Journal of Law & Technology Occasional Paper Series*, 17.
- Prensky, M. (2001). Digital natives, digital immigrants Part1. *On the Horizon*, 9(5), 1–6. <https://doi.org/10.1108/10748120110424816>
- Puschmann, C. (2019). Beyond the bubble: Assessing the diversity of political search results. *Digital Journalism*, 7(6), 824–843.
- Rieh, S., Collins-Thompson, K., Hansen, P., & Lee, H.-J. (2016). Toward searching as a learning process: A review of current perspectives and future directions. *Journal of Information Science*, 42(1), 19–34.
- Rogers, R. (2002). Between contexts: A critical discourse analysis of family literacy, discursive practices, and literate subjectivities. *Reading Research Quarterly*, 37(3), 248–277.
- Rogers, R., Malancharuvil-Berkes, E., Mosley, M., Hui, D., & O'Garro, G. (2005). Critical discourse analysis in education: A review of the literature. *Review of Educational Research*, 75(3), 365–416.
- Saracevic, (2009). Information science. In M. J. Bates & M. N. Maack (Eds.), *Encyclopedia of library and information sciences* (3rd ed., pp. 2570–2585). Taylor & Frances.
- Selwyn, N. (2010). *Schools and schooling in the digital age: A critical analysis*. Routledge.
- Sharma, D., & Sharma, A. (2013). Search engine: A backbone for information extraction in ICT scenario. In S. Chhabra (Ed.), *ICT influences on human development, interaction, and collaboration* (pp. 117–131). IGI Global. <https://doi.org/10.4018/978-1-4666-1957-9.ch006>
- Sparrow, B., Liu, J., & Wegner, D. M. (2011). Google effects on memory: Cognitive consequences of having information at our fingertips. *Science*, 333(6043), 776–778.
- Sun, C.-T., Ye, S. H., & Hsieh, H. C. (2014). Effects of student characteristics and question design on internet search results usage in a Taiwanese classroom. *Computers & Education*, 77, 134–144.
- Sundin, O., Haider, H., Andersson, C., Carlsson, H., & Kjellberg, S. (2017). The search-ification of everyday life and the mundanification of search. *Journal of Documentation*, 73(2), 224–243.
- Sweeney, M. E., & Brock, A. (2014). Critical informatics: New methods and practices. *Proceedings of the American Society for Information Science and Technology*, 51(1), 1–8.
- Talja, S. (1999). Analyzing qualitative interview data: The discourse analytic method. *Library & Information Science Research*, 21(4), 459–477.
- Talja, S. (2005). The social and discursive construction of computing skills. *Journal of the American Society for Information Science and Technology*, 56(1), 13–22.
- Tsai, P., Tsai, C., & Hwang, G. (2011). The correlates of Taiwan teachers' epistemological beliefs concerning Internet environments, online search strategies, and search outcomes. *Internet and Higher Education*, 14, 54–63.
- Vaidhyanathan, S. (2011). *The googlization of everything: (and why we should worry)*. University of California Press.
- Vanderschantz, N., & Hinze, A. (2019). "Computer what's your favourite colour?" children's information-seeking strategies in the classroom. *Proceedings of the Association for Information Science and Technology*, 56(1), 265–275.
- Vtyurina, A., & Fourney, A. (2018). Exploring the role of conversational cues in guided task support with virtual assistants. In *Proceedings of the 2018 CHI conference on human factors in computing systems* (Vol. 208). ACM.
- Wegerif, R., & Major, L. (2019). Buber, educational technology, and the expansion of dialogic space. *Ai & Society*, 34, 109–119.
- Weizenbaum, J. (1966). ELIZA: A computer program for the study of natural language communication between man and machine. *Communications of the ACM*, 9(1), 36–45.
- Wiegand, M. (2016). *Just and its meanings: Exclusivity and scales in alternative semantics and speech act theory* (A-Exam Qualifying Paper), Cornell University.
- Wodak, R., & Meyer, M. (Eds.). (2009). *Methods of critical discourse analysis* (2nd ed.). SAGE.
- Zimmer, M. (2008). The externalities of search 2.0: The emerging privacy threats when the drive for the perfect search engine meets web 2.0. *First Monday*, 13(3).

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