Re-envisioning Search Education through a Critical Information Literacy Lens

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ABSTRACT

Search engines are a pervasive and powerful means of accessing information in contemporary society. Library and Information Science approaches to educating students in information retrieval and online searching focus on search skills and the design of search systems, largely excluding critical perspectives. Major shifts in how information is produced, retrieved, and used require an ethically grounded re-evaluation of these approaches. Critical information literacy offers a framework for deepening pedagogy related to search. We present a case of an undergraduate course that instantiates a critical approach and discuss outcomes, challenges, and plans for future development.

ALISE RESEARCH TAXONOMY TOPICS

education of information professionals; information organization and retrieval; information technologies; sociocultural perspectives.

AUTHOR KEYWORDS

search education; critical information literacy; informatics; search engines.

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INTRODUCTION

There exists a long tradition of teaching and learning in information retrieval (IR) and online searching within information science, which has focused on conceptual and technical understandings of information search systems and search skills (Blank et al., 2011; Fernández-Luna et al., 2009; Smith, 2015, 2017). Such approaches have been disciplinary in nature, situated primarily in library and information science (LIS) or computer science, and have tended to adopt a neutral, positivist stance with respect to the societal impacts of search technology (Haider & Sundin, 2019), inclusive of core notions, such as the benefits of information and the neutrality of information systems (Jansen & Rieh, 2010).

However, the scale and influence of general search engines (SEs) and the recent emergence of generative AI SEs, including Perplexity and Bing Co-Pilot, has created a need to extend disciplinary approaches to search education by adopting a critical information literacy (CIL) perspective and addressing search systems more holistically (Haider & Sundin, 2019). A CIL approach situates learning in the context of students' lives: it creates opportunities to analyze the social, political, and economic systems and power structures that shape their worlds and address personally meaningful questions (Elmborg, 2006; Haider & Sundin, 2019; Tewell, 2015). As social discourse proliferates around issues of misinformation, algorithmic bias, data surveillance, and online censorship, search education needs to address the fact that major SEs, such as Google, Bing, Baidu and Yandex, are at once technologies, businesses, media platforms and socio-technical phenomena of enormous impact (Haider & Sundin, 2019; Halavais, 2018; Shah & Bender, 2022). Solely conceptual, skills-based, and "neutral" technological approaches to search education are no longer adequate nor responsible.

This paper expands upon these claims through presentation of a case of developing and teaching a novel undergraduate course on SEs and society in an Informatics program at a North American research university. We draw upon the experience of designing the course and teaching it several times, starting in 2022.

BACKGROUND

Search Education

Approaches to education for IR have been shaped through shared curricula (e.g., Blank et al., 2011), textbooks (e.g., Croft et al., 2010; Manning et al., 2008; Markey, 2023) and communities of practice (e.g., Bawden et al., 2007). There is considerable consensus over the curricular areas, which include search behavior and skills, text analysis, matching and ranking processes, system evaluation, interface design and a wide range of IR tasks and special topics, and a shared understanding that coverage and teaching approaches will vary across disciplines (Blank et al., 2011; Efthimiadis et al., 2011). Notably, LIS programs go deeper into user perspectives and search skills (e.g., Brown, 2021; Smith, 2015, 2017) and computer science

programs emphasize the technical aspects of IR, but both perspectives are considered essential to the field (Blank et al., 2011; Johnson, 2011). With minor exceptions (Le Deuff, 2018; Witten et al., 2007), curricula and teaching resources for IR education constitute a ring-fenced environment that includes search technologies and its builders, designers, managers and users (Blank et al., 2011; Johnson, 2011), and excludes broader social and ethical issues and other stakeholders, such as SE optimizers, content producers, and public institutions. Issues now at the center of public attention, such as algorithmic bias and data privacy, are no doubt entering the curricula of IR courses, but frameworks for their inclusion are lacking.

Critical Information Literacy

CIL offers a lens for reconceptualizing IR education. Building upon the notion that search knowledge, whether technical or skill-based, is a core information literacy, CIL highlights the need to challenge norms and popular practices, to critically assess sources and platforms (Elmborg, 2006; Tewell, 2015) and question the "social and political ideologies embedded within the economies of ideas and information" (Kapitzke, 2003, p. 49). Critical thinking is a component of information literacy that involves higher-order cognitive processes (Smith & Rieh, 2019), but CIL goes further by drawing upon critical pedagogy to encourage students to challenge norms and investigate issues of power, privilege, and equity. Such outcomes require a broader contextualization of search education that includes pedagogical approaches designed to develop critical consciousness, metacognitive skills, and an active learning orientation among students. CIL-based curricula should resonate with societal needs and enable students to make connections with their own lives and sociocultural identities (Elmborg, 2006; Freire, 1970; Tewell, 2015).

It is worth noting that critical perspectives on technology design and use are often integrated into information literacy instruction courses. In addition, other courses with a sociotechnical focus also bring issues of power and equity to the fore. There is strong existing work in these scholarly and pedagogical areas. However, the learning objectives of such courses do not commonly include deep technical know-how in explaining how information systems operate. This may limit the depth of critique available to students if a more comprehensive understanding of underlying search systems and technologies is not offered. We do not advocate for a purely technology-centered approach, as this would overemphasize one aspect at the expense of others. Instead, we propose a balanced approach that considers socio-cultural and technical aspects. Achieving this balance is a complex task and warrants further exploration in future work.

Critical Studies of Search

The position taken in this paper, that search education should reorient to be inclusive of more critical and contextualized perspectives, is not new, but, rather, has been slow to enter mainstream contexts for teaching and learning search. Important early work on ethics and values in search (Friedman & Nissenbaum, 1996; Introna & Nissenbaum, 2000; Tavani, 2020) laid the groundwork, and has been followed by many valuable and incisive texts, including work by Graham (2023), Haider and Sundin (2019), Halavais (2018), Lewandowski (2019), Noble

(2018), Smyrnaois (2018), Zimmer (2008a) and Zuboff (2019). These authors and texts (among many others) have inspired and informed the development of this course.

THE COURSE

Motivation & Goals

In 2021, two of the authors were tasked with the development of a new upper-level undergraduate course as part of an Informatics minor open to students across faculties. This presented an opportunity to approach search education in a novel manner. Student learning goals were to:

- make use of search systems intentionally in their own lives (Elmborg, 2006);
- interrogate search systems as designed technologies: the product of human decisions that are socially-situated and shaped by ethics, values and power dynamics (Friedman & Hendry, 2019; Friedman & Nissenbaum, 1996);
- analyze complex societal issues such as algorithmic bias, gatekeeping and misinformation through the examination of SEs as a keystone Internet technology.

An important guiding principle is to ensure that students gain sufficient understanding of search technology to enable a grounded and informed critique. This principle shaped decisions about the structure, content and pedagogical approach of the course.

Course Design

The course consists of two main modules. The first 6 weeks cover the basics of SE technology, addressing the components of SE architecture and use, including crawling, indexing, ranking, search user interface design, and user interaction. This module extends the traditional "searcher, designer, builder" focus identified by Johnson (2011) by introducing a broader set of stakeholders, including SE companies, SE optimizers, web content owners and advertisers to lay the ground for later discussions of search economics. The second module spans the remaining 7 weeks of the course and covers a range of topics from a critical perspective. Within each of these topics, specific examples from current news reports are discussed:

- Ethical issues in search (Hinman, 2005; Introna & Nissenbaum, 2000; Tavani, 2020);
- Advertising as a business model (Segal, February 12, 2011; Smyrnaios, 2018; Sweeney, 2013);
- Copyright and access (Gold & Latonero, 2018; Karaganis, 2018; Somers, April 20, 2017);
- Bias and misinformation (Friedman & Nissenbaum, 1996; Gao & Shah, 2021; Noble, 2018);
- Gatekeeping and censorship (Diaz, 2008; Meserve & Pemstein, 2017; Stjernfelt & Lauritzen, 2020);
- Data surveillance and privacy (Faillo et al., 2008; Zimmer, 2008b; Zuboff, 2019);

- Regulation (Lamoreaux, 2019; Lewandowski, 2019; Silverman & Talbot, December 21, 2022); and
- Emerging technologies (Bender et al., 2021; Epstein et al., 2017; MacFarlane et al., 2022; Shah & Bender, 2022).

Each week there are two class sessions: one is primarily a lecture introducing the topic and allowing for discussion of the readings; the second session is devoted to group labs. In the labs, students engage directly with aspects of search, drawing upon online resources and lightweight tools. Labs are hands-on and require students to collaborate, share experiences, and respond to discussion questions, to strengthen the connections with their own lives. For instance, in the first lab, students manually work through the processing of webpages into index representations assisted by Voyant Tools (voyant-tools.org), a simple web-based text analysis application.

Assessment includes: 1) a search diary assignment in which students document and reflect their own searches; 2) a closed-book midterm including one self-assigned topic; 3) graded lab reports; and 4) a term paper on a topic chosen by the student.

Observations & Outcomes

We have offered the course three times to date, with an average of 37 students. Student feedback to date is positive based on student evaluations of instruction: 96 percent of respondents rated the course as very good or good, and 100 percent agreed that they learned a great deal.

Highlights and Challenges

This is a dynamic and engaging course to teach. Student enrollment from across campus enables a rich exchange of perspectives as students draw upon their disciplinary learning from their primary programs of study. By intentionally diversifying the backgrounds of students in lab groups, we observe many examples of students sharing skills and knowledge and investing in bridging and clarifying conversations. The international profile of students in the course also contributes to the richness of discussions in relation to the global nature of search.

The value of starting with a shared grounding in SE technology is evident through the rest of the course in the depth of discussions. The extent to which SEs and SE companies are in the news ensures that the course is relevant, increasing student engagement. World events in 2022 included the outbreak of war in Ukraine and associated censorship issues involving the Yandex SE (MacFarquhar, July 6, 2022) and the Digital Markets Act in the European Union, which places limits on major SEs (Paul, March 25, 2022). During the 2023 course offering antitrust cases against Google continued to be in the news ("A Showdown Between the DoJ and Google Begins," September 13, 2023; McCabe & Kang, September 6, 2023; Paul, September 11, 2023) and both Microsoft and Google launched controversial AI search tools (Grant & Weise, April 7, 2023). This created a rare opportunity to test and discuss new technologies in real time in the classroom (Bender & Shah, December 13, 2022; Grant & Metz, December 21, 2022; Weil, March 1, 2023).

The opportunity for students to select their own topics for the term paper allows them to address their own goals. Many papers connected with personal identity or went deep into specific areas of interest. Consistent student feedback indicates an appreciation for in-class labs and discussion groups and the relevance of the course material to their lives.

Defining the scope and coverage of the course is a challenge. The fact that SEs are now critical infrastructure means that the impacts of search are widespread and not all topics can be addressed. For example, the current version of the course does not address the significant impacts of search technologies on human information practices and epistemic constructs, such as authority and truth, although this is rich territory for critical reflection (Haider & Sundin, 2019). Further, spending one week on each broad topic, such as algorithmic bias, censorship and privacy, is limiting. Extending discussion beyond the major SEs – i.e., Google and Bing – and the North American and European context is also a challenge, and students expressed a desire to explore search in other national contexts to a greater extent.

Addressing varied levels of knowledge and skills is a perennial challenge in teaching technology-centric courses in multi-disciplinary contexts. This challenge played a role in the design of the labs. Despite early plans for direct engagement with search technologies in the labs, it quickly became clear that in the space of a 75-minute session, only very simple tools could be used (e.g., Google Trends, Voyant Tools). Another early goal was to devote the final weeks of the course to identifying ways to respond to the many critical issues raised, such as government and trade regulation and personal choices to use privacy preserving technologies. However, student feedback on the first offering made it clear that a more agentic, solutions-based approach needs to be introduced earlier in the course to avoid students becoming overwhelmed by the many issues explored. We have now incorporated a new framing into the classroom activities and assignments and will continue to develop this aspect of the course through exploration of critical pedagogical approaches.

DISCUSSION & CONCLUSIONS

This course occupies a unique niche within the landscape of search education, as is not intended to train students to be either expert searchers or system builders, the two roles which have defined search education to date. Rather, it offers space to examine search technologies and their implications in a broader societal context. As such, the course contributes to the CIL of the students, building their understanding of search systems as social, economic and technological systems, and their abilities to employ such systems, critically, in their own lives (Marty, 2022). The "infodemic" experienced during the COVID-19 pandemic is one of many current examples pointing to the need for such courses in university curricula (Avcı & Yıldız Durak, 2022). For those students enrolled in informatics, computer science and engineering programs, the course is an opportunity for critical reflection on the design values and impacts of such technologies. Several students in the first offering of the course used it explicitly for this purpose.

Beyond these specific outcomes, the experience of developing and offering this course indicates that the history and current manifestations of search offer a fertile ground for teaching and learning about the role of technology in society. As noted by Jones (2009), students are motivated by the chance to study something that is part of their daily lives, and there are so many compelling stories to share about search, ranging from inspiring to thought-provoking and deeply disturbing. In teaching a similar course on information technology, Marty (2022) reached much

the same conclusion, also highlighting this as an area where LIS educators can make particularly valuable contributions.

There are many opportunities to improve upon the course, and we hope to receive feedback from the LIS community to inform our ongoing efforts. An important goal is to more fully adopt critical pedagogical approaches, which aim to empower students (Tewell, 2015). This may offer a means to address the challenge described by Haider and Sundin (2019): how do we simultaneously teach the knowledge and skills needed to search effectively, while critiquing the systems and the infrastructure? How do we sustain optimism and agency in the face of evidence of, for example, systemic discrimination, data surveillance, and monopolistic business practices? Other fields, such as journalism, cope with related issues by adopting solutions-oriented approaches, which we hope to build upon (Godsmark, 2020).

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