

Be Slow, Skeptical, and Classify: Recommendations for LIS Education

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This paper argues that medium for information access becomes central to library and information science. The author discusses the notion of medium, medium neutrality, and personalization and suggests that the dominating paradigm of providing fast, efficient, and neutral systems and services for retrieving information has sidetracked opportunities to explore the impact of medium on information access. The paper makes three specific recommendations for library and information science education: be skeptical, slow down, and understand classification.

Keywords: classification, information ethics, knowledge organization, philosophy of information, privacy

There is good news for anyone concerned with library and information science education. Today everyone speaks in the lexicon of information

KEY POINTS

- The medium for information provision ought to play a central role in LIS scholarship and education.
- The aim for neutrality has misguided LIS. The focus should instead be on the consequences and possibilities that specific systems, platforms, or techniques have for information provision.
- Three recommendations for LIS education are provided: (1) be skeptical; (2) slow down; and (3) understand classification.

science: “we now find ourselves capturing, cataloging, categorizing, censoring, classifying, collecting, communicating, computing, and cultivating information” (Peters, 2016, p. xxii). In their daily lives, people use digital technology and social media for communication and everyday tasks, and the algorithms used to organize and seek information play “an increasingly important role in selecting which information is considered relevant to us” (Gillespie, 2014, p. 167). Today, Google shares Paul Otlet’s and the Dewey Decimal Classification’s visions to *organize the world’s knowledge*. It seems that what was once the sole domain for librarians and information professionals has now captured the public’s imagination. The challenge for library and information science

educators is to form a response to this overwhelming integration of their language and expertise into the everyday activities of lay people. Which competences are required for librarians and information professionals in a world where everyone does information work every day?

In this paper, I propose that the *medium* for information provision ought to become the central phenomenon in library and information science (LIS). I argue that the field's dominating paradigm of providing fast, efficient, and neutral systems for information retrieval has sidetracked the field at the expense of explorations into the medium used to facilitate access to information. In this paper, I propose three concrete recommendations that LIS educators can take to redirect LIS education to become central in today's media landscape. A first and more principled move is to leave behind the field's allegiance to *neutrality* as a core value; common to the three recommendations I make is that they regard the medium as being inherently political and ethical, and that they view the medium as shaping information and communication.

I propose that library and information science educators teach students to *be skeptics*, that is, to educate future librarians and information professionals to know that there are multiple answers to open questions and to design systems and provide services that allow patrons to locate multiple perspectives on open questions—and the correct answer to closed questions. Library and information science educators should *slow read* systems, techniques, and platforms for information provision and show students how and in which ways the specific information medium shapes the interaction and the information provided to users. Lastly, I propose that future librarians and information professionals need to *understand classification* at a much more foundational level to appreciate how categories are part of culture, cognition, and language and that they are the foundation for any interaction with information through catalogs, search engines, or social media.

Neutrality as a value proposition

Library and information science has historically been institution-specific and medium-neutral. The field has formed its identity around *activities* (organizing, seeking, retrieving, using information) that take place in specific *institutions* (libraries or library-like), and the field has viewed the *medium* (catalog, online search service, classification system, cataloging rules, librarian) used for the activities as a neutral intermediary that facilitates the connection and communication between information and user. The result has been a field that has constrained itself to activities in specific institutions, with the goal of improving the interaction between user and the requested information, and between the user and the information system. Until recently, the sole focus of educational programs was to provide students with competences to employ the tools used in these institutions, in order to prepare them for a

future in a specific professional setting. Library and information science programs were essentially professional educational programs that provided students with the needed competences to succeed in a specific workplace context.

The mission for librarians and libraries was, for many decades, along the following lines: “we can, or should try to, produce the one best classification system that will serve all purposes” (Miksa, 1998, p. 81), with “the ideal of achieving international bibliographic control” (Miksa, 2009, p. 139). This mission was supported by the fundamental belief that information systems should reflect the universe of knowledge. It was assumed or taken for granted that a universe of knowledge exists and that library systems ought to be designed such that they represent this universe of knowledge and ultimately give access the universe of knowledge. In this sense, the medium used to organize the universe of knowledge was without consequences; the universe of knowledge is what it is, regardless of which medium was used to represent the universe of knowledge. It did not matter whether the universe of knowledge was represented via a card catalog, an online catalog, or a search engine—an enumerative, faceted, post-coordinated, or pre-coordinated system. The goal was the same: to create a system that serves all users and all content. It was silently assumed that the medium itself had no impact or influence on the representation and presentation of the universe of knowledge. What mattered was which medium would create the best and most efficient access to information for the users. The only criterion employed to differentiate between different media was to measure speed and efficiency.

This notion of medium-neutrality is also reflected in the very definitions and understandings of information science. Borko (1968) offered a definition of the field in his now classic paper, “Information science: what is it?,” which more or less has become the standard definition and understanding of the field:

Information science is a discipline that investigates the properties and behavior of information, the forces governing the flow of information, and the means of processing information for optimum accessibility and usability. It is concerned with that body of knowledge relating to the origination, collection, organization, storage, retrieval, interpretation, transmission, transformation, and utilization of information. This includes the investigation of information representations in both natural and artificial systems, the use of codes for efficient message transmission, and the study of information processing devices and techniques such as computers and their programming systems. (Borko, 1968, p. 3)

Saracevic’s (1992) much-cited definition of the field echoes Borko’s understanding of LIS as being concerned with processes and procedures

that take advantage of information technology to make searching effective and efficient:

Information science is a field devoted to scientific inquiry and professional practice addressing the problems of effective communication of knowledge and knowledge records among humans in the context of social, institutional and/or individual uses of and needs for information. In addressing these problems of particular interest is taking as much advantage as possible of the modern information technology. (Saracevic, 1992, p. 11)

Common to both Borko's and Saracevic's definitions is that information/knowledge is reified and made a commodity that is subjected to effective and efficient management in information systems. That challenge is seen as bringing the most relevant information/knowledge to the right users as quickly as possible. The definitions assume that information is in scarcity and is something people have a need for. Information is a *thing* that is processed, organized, retrieved, and used by a system or a human.

While there have been many discussions of the notion of information, both within information science and within philosophy of information, and while there is a movement toward understanding "information" as contextual, situational, and bound to meaning and meaning-making processes (cf., e.g., Day, 2008; Furner, 2004; Mai, 2013; Nunberg, 1996; S oe, 2016), Stock & Stock's (2013) excellent overview of information science still defines information science as "stud[ying] the representation, storage and supply as well as the search for and retrieval of relevant (predominantly digital) documents and knowledge (including the environment of information)" (p. 3).

In Borko's (1968) and Saracevic's (1992) as well as Stock and Stock's (2013) conceptualizations of information science, the main challenge is to devise systems that can handle information effectively and efficiently. The measurements of success are speed, efficiency, and relevance. Neither Borko nor Saracevic considers that the medium has an effect on the information retrieved from the system, that the system shapes and forms the interaction with the user and forms the user's understanding of the subject matter. We know today that it does matter whether one uses Google's personalized, algorithmic search or the Dewey Decimal Classification to learn about a subject matter—we have, to use McLuhan's phrase, accepted that "[t]he medium is the message" (1964, p. 13). In other words, how the universe of knowledge is organized and expressed differs from medium to medium—Google and DDC do not merely express and represent the universe of knowledge; the medium itself (search engine vs. classification system) shapes the universe of knowledge and what is possible.

While one could have philosophical discussions about the notion of the existence or even the possibility of a universe of knowledge, in the library world the notion was constructed to solve a practical challenge: how

to organize books on shelves. As Miksa notes, library classificationists in the early twentieth century perceived that their “task had everything to do with practicality and very little to do with philosophical speculations about knowledge” (1998, p. 46), and as such a core belief of the field was formed not out of a theoretical work and principled discussions but out of Melvin Dewey’s Eureka! moment one Sunday morning while listening to a long sermon (Wiegand, 1996, 1998). Dewey’s idea was a practical solution to a customer service problem; at the time a book would have different call numbers in different libraries—this was confusing to patrons. Instead, Dewey suggested, call numbers should be constructed according to the book’s topic’s placement in the universe of knowledge, and not according to the book’s physical placement in libraries. Unfortunately, this practical solution to a philosophical problem has had a lasting impact on the field’s self-understanding.

In Miksa’s (2009) review of the two classic textbooks in cataloging and classification—Lois Mai Chan’s *Cataloging and Classification: An Introduction* (2007) and Arlene Taylor’s *Introduction to Cataloging and Classification* (2006)—he finds that cataloging and classification focus almost exclusively on technical procedures, and that the two books do not include anything that would inspire the reader to view cataloging and classification as “worthwhile, even inspiring, endeavors” (p. 141). He ends his review by saying,

Finally, there is the matter of creating a unified rationale for cataloging and classification that would not simply recognize the past and the present but also offer reasonable inspiration for the future. Mention has already been made of the reality that no present text offers such a rationale. In this respect, the Chan and Taylor texts, despite all of their strengths, seem “tired” when it comes to eliciting such a vision. That they are is not so much a fault of the authors, however, as much as it reflects the contemporary climate of thought in library cataloging and classification. At some point between Mann’s text [i.e., *Introduction to Cataloging and the Classification of Books*, from 1930] and the appearance of new texts since the 1960s, cataloging and classification had already started down the road of being thought of only or merely as access mechanisms without the complications and implications that arise from their relationship to the origin, character, and organization of humankind’s knowledge. The latter is, to say the least, a striking social phenomenon in its own right, and given its extraordinary nature I cannot help but think how grand a change would occur in texts on cataloging and classification were they to capture at least some of that extraordinary character in their vision. (p. 143)

It is concerning that at a time when everyone speaks in the lexicon of information science, and where the organization of and search for

information have become daily tasks for everyone, the field of library and information science does not demonstrate more imagination regarding the field's central phenomenon: the catalog.

Unfortunately, through the history of the field, the focus has been more on perfecting existing systems and procedures within an established conceptual and theoretical framework, instead of innovating the field and updating practice and knowledge accordingly. As Williamson (1982, p. 124) noted over 35 years ago, "We have perfected the catalog which has existed for more than one hundred years without significantly improving the kinds of bibliographic and subject access that the catalog might provide. Nor have we experimented sufficiently with possible new approaches to subject retrieval of bibliographic items which modern technology could support." These words are as true today as they were then.

This grounding in the understanding of the catalog, technology, media, and the universe of knowledge laid the foundation for the notion of "neutrality," which has later been ingrained in both the ALA's Code of Ethics (ALA, 2008) and IFLA's Glasgow Declaration (IFLA, 2002). The basic standpoint is that, as Wilson (1983, p. 190) argues, that libraries and librarians have "no politics, no religion, and no morals" and that they demonstrate "complete hospitality to all opinion"; their standpoint is one of "studied neutrality; the librarian is professionally noncommittal." This standpoint of neutrality has led to the "pervasive belief among information scientists that in order to create an overriding unity in language the diversity and subjectivity of language need to be standardized," and that librarians and libraries ought to become "'neutral' intermediaries" (Olson, 2001, p. 640). To achieve such neutrality, information systems are constructed to standardize meanings of natural language—"librarians call such a constructed universal language a *controlled vocabulary*" (p. 640)—and since these systems follow a cultural mainstream, they "appear neutral, objective, and transparent. This makes marginalizations and exclusions difficult to identify" (Olson, 1998, p. 252).

In other words, the goal and purpose of libraries and information retrieval systems were never to explore and understand the medium used to organize and seek information. It was assumed that the medium is merely a neutral channel through which librarians and information professionals facilitate gain access to books and information.

Practicing information work

Library and information science education is founded upon a tradition of studying and understanding the activities of organizing, seeking, retrieving, and using information in libraries or library-like institutions, while being neutral regarding the medium employed. The goal and objective were merely to facilitate access to information in an effective and efficient manner in which users obtained the right and relevant information as needed. Ranganathan (1931) famously formulated five laws of library

science, one of them being “Save the time of the reader,” and Cutter’s (1904) “objects” of the catalog were concerned with easing access by enabling the user to find what they are seeking, to show what the library has, and to assist in the choice of exemplar. Later, Wilson (1968, p. 22) spoke about the objective of libraries and information systems as having the “power to produce the best textual means to one’s end.” In fact, Ruthven (2008, p. 43) argues that because there is now more information and more sources of information available, “[t]he ability to extract useful information from large electronic resources not only is one of the main activities of individuals online but is an essential skill for most professional groups and a means of achieving competitive advantage.” In other words, the focus for the field has been on making information available “easier, faster and better” (Feinberg, 2017, p. 340).

While the paradigm of fast and effective systems for retrieving information has served the library and information science field well for more than a century, the field also has a century worth of experiences in the challenges and (im)possibility of creating neutral and objective information systems. Those experiences are today more needed than ever. Therefore, if one were to shift the almost single-minded focus away from the fast-effective-retrieval-paradigm that has dominated library and information science, and instead focus on the *medium* used for the information organizing, seeking, seeking, and retrieving activities, then LIS could gain relevance as the primary field for the study of the consequences of the digital information society. The field has gained experience and expertise in understanding the challenges of maintaining a belief in objectivity and neutrality, and it has realized the importance of understanding context, culture, and situation as the foundation for information provision. In fact, speed and efficiency are not as important as understanding, didactics, and users’ lived experiences. In other words, what is important today is a focus on the technological, political, and ethical dynamics that have created the particular medium employed in information provision.

There are good reasons for such a focus on the medium—the institutions (libraries and tech giants alike) that provide information to the public possess immense powers. They have the powers to decide which information to include and exclude from their search results, how to describe the information, how to make the information available, and how to rank the search results. As such, these institutions have “the power to ensure which public impressions become permanent and which remain fleeting” (Pasquale, 2015, p. 61); they hold the power over what information people are provided with. As a society, we therefore have an obligation to study, understand, and discuss the principles by which these institutions make information available to us. While contemporary search engines are difficult to grasp technologically and most are trade secrets, it is important that we appreciate the immense impact they have on society, as “they have become the default mode of knowledge acquisition” (Chun, 2016, p. 1).

Library and information science has in the past had a specific interest in professionals (librarians) helping or assisting lay people finding and retrieving information. Today, however, “the activities and practices of ordering, listing, archiving, categorizing, and searching are carried out by people in their everyday interactions in digital networks, suggesting that the organization of knowledge is a tool used to make sense of our daily routinized communicative interactions” (Andersen, 2017, p. 2). As such, the lexicon of information science—the organization, seeking, retrieving, and use of information—becomes ingrained into everyday life and forms the basis for a new digital culture, and “one cannot experience digital media without also practicing knowledge organization: people construct queries, examine results, and access retrieved items as a matter of course when interacting with digital content” (Andersen, 2017, p. 2). In other words, the significance of information science becomes larger than certain activities in specific institutions—it has become the foundation for our current digital culture.

Personalization

In the digital culture, algorithms not only locate and find information; they also select information, sort it, rank it, and determine the precise information that is relevant for the specific user at that particular time and place (Gillespie, 2014). To function effectively, algorithms are fed personal information about users; the more information they have about users’ situation, preferences, history, and relations, the better and more effectively they will function. As social networking sites and search engines continue to integrate, “networked citizen-consumers move within personalized ‘filter bubbles’ that conform the information environment” (Cohen, 2013, p. 1917). Users are thereby not merely presented with relevant information, but they are provided only with the information that is relevant to them personally in their specific situation and context. In fact “personalization is the new religion of the information society, and the quant jocks of Big Data are its high priests. The skeptic’s questions about downside risks go unanswered, and often unasked” (Cohen, 2013, p. 1923).

While library and information science has concerned itself with the subject matter of information as a means to match users’ interests with the relevant information, the user has now become the subject of the matching; today’s search engines analyze the subject (i.e., the user) for their interests and retrieve information that matches those interests (Day, 2014). Library and information science has been concerned with the analysis of information for its subject matter and matched that with users’ expressed interests, and it has long been an open question how feedback from users can be used to improve retrieval (Efthimiadis, 2000). However, since the days of relevance feedback and query expansion, search has become black-boxed (one seldom understands why one is presented specific information) and personalized (what I retrieve based on a particular search is

different than what you retrieve, even if we use the same terms to describe what we look for). While tech giants' algorithms are often criticized for being black boxes (Pasquale, 2015) and for having an immense impact on people's experience in the digital environment (Gillespie, 2014), the traditional library catalog is, in fact, also black boxed: ordinary citizens do not understand why they are presented with the specific information they receive from a library catalog.

Both private institutions (Facebook, Google, Twitter, etc.) and public libraries claim allegiance to modernity's concepts such as *neutrality* and *objectivity* and to its aim to *organize the world's knowledge*, however, we ought to be critical about such claims and acknowledge that these are unattainable in an ever more diverse world and with the current information explosion. In fact, it has long been a mantra that users do not want just some information, but want "what we can call the *best textual means* to [this] end" (Wilson, 1968, p. 21; emphasis in original). In such an understanding, it was previously questioned how libraries were able to deal with plurality: "if we admit that the number of different perspectives from which the world can be viewed and described is endless, we shall expect the library to contain competing, conflicting accounts of the world" (Wilson, 1983, p. 165). Whereas systems to organize information in libraries did not accomplish diverse, personalized information provision, new digital services and platforms have specialized in providing personalized information search and retrieval, at the expense of users' anonymity and privacy.

The ability to provide precise, relevant, and context-dependent information requires that information institutions have an exact, complete, and accurate profile of their users. This profile is often constructed via complex predictive analyses of personal information harvested from users' interactions with various digital platforms across their everyday activities. This ability was lacking in previous information societies; users were provided the same information regardless of background and profile—there was no personalization of services. In fact, one of the core values of the modern Western library is that its services are provided anonymously and that users' anonymity and privacy are secured (cf. ALA 2008; IFLA 2002). Library users were treated equally regardless of who they were; they were provided the exact same information in response to the same request—previous interactions with the library played no role in the provision of information. The only issue that mattered was whether there was a match between the information's subject matter and the subject matter users expressed an interest in.

Library and information science education and librarians and information professionals have a special role to play in the new media landscape, data economy, and focus on personalized services. While one can easily get drawn into the neoliberal idea of giving users what they want, and therefore create profiles of users, it is worth remembering that both the ALA codes of ethics (ALA, 2008) and IFLA's Glasgow Declaration

(IFLA, 2002) speak of privacy as a core professional value of librarians and information professionals. Unless the field is willing to move to another set of ethical principles, then we need to design systems and services that protects users' privacy and take a stand against the creation of user profiles and personalized services.

Three recommendations for the future of LIS education

In an age of “fake news,” information overload, and search engines that provide more echoes than enlightenment, there is a need to slow down, be skeptical, and focus on understanding and diversity. That ought to be the agenda for libraries, librarians, and education in library and information science. While others have been excellent in perfecting search and making it more effective and efficient than ever, library and information science should take a step back and explore the building blocks for designing today's information systems. I want to make three recommendation which together ought to further the field and set the frame for educational programs in the field.

Recommendation #1: be skeptical

Wilson (1983) explores which principled positions librarians could take to be recognized as authorities. While the neutral, liberal position has been the standard recommended position in the field for more than a century, Wilson explores other possible positions. His explorations center on the notions of closed and open questions. Closed questions are those that, for all practical purposes, may be considered as settled: those that we do not ordinarily question or seriously doubt. Sometimes a question that was previously closed may be opened up again and debated once more in the literature and public discourse. Open questions are those about which there are competing answers, competing avenues for addressing the problem, and differences in strategies in determining proper answers. Determining whether a particular question is closed or open may “itself be a closed question, but it may also be wide open” (Wilson, 1983, p. 17), and sometimes we may turn to our cognitive authorities to determine exactly this—whether a question is open or closed, and what the arguments are for and against regarding the question as closed.

While people may want specific answers to closed questions, it should be clear that in open democracies, there is a need for people to get more nuanced answers to open questions. Wilson phrased it this way:

As to that question, there appear to be two different opinions held by various people. I take no position on the matter myself, but I can tell you what appears to be said on each side of the question, and on each side against the other side. Of course, you are not interested in what just anyone says; you want to know who is worth listening to. As to that question, I take no position myself, but I can tell you what people say about who is worth listening to.

Of course, you are not interested in what just anyone says about who is worth listening to. You want to know whose opinions on that question are worth taking seriously. I take no position on that matter, though I can tell you who the different people are and what they say about why they should be attended to. If you want more than that, I can tell you only what people say. You want a guarantee or at least a recommendation from me, but I give no guarantees and make no recommendations. You fear that if you believe this one rather than that, you may be misplacing your trust. As to that, it appears to me that you may well be right. (1983, p. 194–195)

In other words, a trustworthy information system is one that strives to be an “authority on authorities” (Wilson, 1983, p. 179) and one that can determine which resources can be trusted on a given topic, which resources are of high quality, which views are in the minority, which views can be ignored, and which view is the majority view. Such information systems are important because most of our knowledge “about the world is what we have second hand from others” (p. 10)—“it is all hearsay” (p. 13)—but not all hearsay is “equally reliable” (p. 13), because while “some people know what they are talking about, others do not. Those who do are my cognitive authorities” (p. 13). Libraries and information systems ought to strive to become cognitive authorities, that is, institutions that people turn to for advice and information and that influence their thinking about the world.

It is not enough to provide answers to closed questions; the real challenge is how to address open questions in a world of uncertainty, alternative facts, and diverse world views. A strength of librarians and information professionals could be exactly “noting the counterargument for every argument” (Wilson, 1983, p. 194) and seeking to provide services and to design information systems that strive for such skepticism.

The basic criteria for a skeptical information system would be to never settle for an answer, to help and facilitate the users to keep exploring, so that they understand their question is in indeed open and that there are competing answers to the question, that different people have different answers, but also that these people speak with varying degrees of authority.

Recommendation #2: slow down

One direct way to challenge the notion of medium neutrality is to *read* the medium used to facilitate access to information, be it a search engine, a classification system, or a database. Feinberg (2017) provides a systematic approach to such an exercise, which she calls “slow information” (p. 337), as opposed to the focus on “outcome-oriented retrieval interactions—fast information” (p. 349), and as such “the idea of reading databases is broader than retrieval” (p. 340). It is not that retrieval does not matter—in

fact, it does matter a lot—it is just that there is much more to databases than providing access and facilitating retrieval:

Many of the everyday information systems that we encounter . . . are more than mere repositories, and we do more with these systems than just retrieve items from them. Why do people read maps for places they have never been and do not plan to visit? It is because the map itself is more than a repository of routes; it is a mechanism for synthesizing, structuring, and interpreting information. Importantly, using maps for more than navigation is not unusual. In fact, it is so common and typical that it seems strange to insist that we do more with maps than search them to extract their facts. Of course we interact with maps in diverse ways! So why does information studies research continues to focus predominantly on using search engines for task-oriented information seeking and retrieval? We do more with information systems than search them, and there are many more kinds of information systems than search engines, systems that we use every day: from supermarkets, maps, and shoe-shopping websites to photo albums, Facebook, and Twitter. (p. 337)

Feinberg explores how various databases (information systems) might be *read* to gain an understanding of a phenomenon—for instance, she suggests that one can use Google Maps not just to find out how one might get from point A to point B, but also to investigate an unfamiliar neighborhood or see how various neighborhoods relate to each other, to make sense of a guidebook’s descriptions, and one can compare Google Maps’ rendering of place with “public transportation maps, maps of inexpensive restaurants, or historical maps” (p. 342). The possibilities are endless.

Feinberg (2017) argues likewise that a search in Google’s search engine that might appear simple and straightforward does in fact require selection work on the part of the user: “for many retrieval interactions, this reliance on the searcher’s labor is not noticed, or is perceived as trivial, because the need is simple and concrete, and few sources are required” (p. 346). A slow information approach would explore how to facilitate the user’s selection labor and understand how the larger infrastructure works, including the implicit cultural and social conceptual spaces that frames the meanings and understandings involved in the construction and use of the search engine. In another example, Feinberg explores a commercial website that sells shoes to understand how that website employs particular terms related to shoes. In her interrogation, she uncovers how terms that at the surface might appear simple and straightforward in fact do have particular meanings in the universe of the website.

As such, a “slow information” approach and reading of databases supplements and augments a more traditional “fast information” approach: slow information provides unique insight into the information system and

helps develop a design approach to information systems that facilitates not just the quick and easy but also enlightenment. There is a need to slow down and focus on understanding and diversity.

Recommendation #3: understand classification

There has been much hype about big data since Anderson wrote in a short piece in *Wired* in 2008 that, “with enough data, numbers would speak for themselves” and that there therefore was no need for interpretation, hypothesis, and understanding. This is a hype, of course, but it is a dangerous hype that “leads to the withering away of interpretation—not through the actions of a cabal, but through a sociologic excluding from the archive all data which is not big” (Bowker, 2014, p. 1797) and which, “thanks to relatively simple algorithms[,] allow[s], on a purely inductive statistic basis, to build models of behaviors or patterns, without having to consider either causes or intentions” (Rouvroy, 2013, p. 143).

While there has been some discussion of the fact that algorithms—like all classifications—produce biased classifications, a more important discussion is to understand the role that categories and classifications play in the design of algorithms. Unlike Anderson’s (2008) rosy depiction of big data and algorithms as somehow speaking for themselves, algorithms operate with symbolic representations of the world; algorithms are categorizations of the world. What is perhaps less understood is the role that categories and classification play in the design and construction of algorithms. The view that Anderson expresses is close to what I elsewhere have called “classification-as-ontology” (Mai, 2011, p. 711), which is the idea that classification is merely a one-to-one representation of the world as it is—the idea that what we see in a classification is simply a description of the world as it is. This is of course a naïve position, and a position that library and information science at least at the theoretical level has abandoned. A more dominating approach to understanding classification (both within library and information science and beyond) is what I have called “classification-as-epistemology” (Mai, 2011, p. 711), in which a classification is understood as one possible representation of the world, and each category is viewed as a particular expression or statement that is open for interpretation.

This understanding of categories and classification draws on Bowker and Star’s (1999) analysis of how classifications penetrate science, society, and culture and how classifications have become invisible. Bowker and Star demonstrate that classifications of diseases, viruses, tuberculosis, race, and nursing work, which at the surface may look innocent and perfectly fine, in fact have consequences and are based on specific assumptions about the world; as they note, classifications might “as with many strange things . . . become well adapted to the modern bureaucracy” (p. 131). To understand the basic assumptions hidden in classifications, Bowker and Star argue, we need to bring classifications out of their contexts, because

“classifications that appear natural, eloquent, and homogenous within a given human context appear forced and heterogeneous outside that context” (p. 131)—and only outside their contexts will the forced nature of classifications be revealed.

Likewise, there is a need to bring the classificatory assumptions baked into the design of algorithms out of their context, out in the open for discussion and interrogation. This requires that classification not merely be thought of and taught as procedures and processes but as a broad scholarly discipline that asks foundational questions of the relation between the world and its representations in systems and algorithms.

Conclusion

In an age where everyone speaks in the lexicon of information science, library and information science educators need to revise and rethink the basic objectives of their curriculum. My proposal does not involve a complete makeover of library and information science—it merely requires that we go back through the traditions of the field and make paths that were previously considered sidetracks or minor paths into the major, central avenues of thought and work in library and information science. Central to my proposal is to make the *medium* for access to information central to investigations and to give up the notion that media are neutral channels that facilitate the flow of information. The medium shapes and forms the information itself, as well as the interactions users will have with information.

For this purpose I have made three concrete recommendations for library and information science in this paper: (1) *be skeptical*: design systems and services that allow for continuous exploration of open questions; (2) *slow down*: read the systems that are used for information access in order to understand their cultural, social, ethical, and linguistic constraints and assumptions; and (3) *understand classification*: now more than ever is it important to understand the foundational nature of classification and categories in the design of information systems. These paths of inquiry already exist in the library and information science literature and tradition; however, given the dominating paradigm of providing fast, efficient, and neutral systems and services for retrieving information, these paths have been sidetracked. If they were to become the central focus in library and information science, the field would contribute substantially to today’s lexicon of information science of “capturing, cataloging, categorizing, censoring, classifying, collecting, communicating, computing, and cultivating information” (Peters, 2016, p. xxii).

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