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Encounters beyond the interface: Data structures, material feminisms, and composition

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Approved by Major Professor(s): Jennifer Bay

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ENCOUNTERS BEYOND THE INTERFACE: DATA STRUCTURES,

MATERIAL FEMINISMS, AND COMPOSITION

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ABSTRACT

Masters, Christine L. Ph.D., Purdue University, August 2016. Encounters Beyond the Interface: Data Structures, Material Feminisms, and Composition. Major Professor: Jennifer Bay.

This dissertation argues that data literacy should be taught in college writing classes along with other new media literacies. Drawing from several areas of study, this dissertation establishes a definition of data literacy, introduces a feminist methodological approach to Big Data and data studies, and makes a case for teaching data literacy in first year composition and professional writing courses as a foundational writing-related literacy. Information written into and read from databases supports research activities in any number of fields from STEM to the humanities; while different disciplines approach databases and data structures from diverse perspectives, all students need foundational data literacies.

Nearly all digital environments are facilitated in some way by databases. They drive a range of web applications in ways that most users do not realize. On the surface, only GUIs are visible, and sets of data could be presented in any number of ways through them in the form of visuals, texts, and sound. It is important that students learn how data structures influence what comes across in the interface. By having students rhetorically analyze databases and then create them, composition teachers can help to demystify these

 ubiquitous yet invisible technocultural objects. Becoming aware of data structures gives students insight into how digital compositions emerge, empowering them to be more than "users" or "subjects" that use technological "objects." Ideally, they would gain insight into how both "sides" of this encounter arise in dependence on many contributing factors, such as the standards, classifications, and categories perpetuated by techno-cultural infrastructures.

Developing a socio-ontological methodology that combines scholarship in both feminist new materialisms and feminist rhetorical methodologies, this dissertation discusses the importance of researcher positionality. The socio-ontological methodology developed here expands on social constructivist theories to view all participants in a situation, including non-human ones, as mutually existing in dependence upon each other. Within this framework, contemplative mapping helps to articulate how the researcher does not exist outside of the research situation and assists in helping to make the situation uncanny, so that we can question assumptions and think through processes.

Providing a foundational understanding of why data structures have become important to our professional and personal lives, this dissertation explains the public fascination with Big Data and exposes the ways that individuals can be affected by data collection practices, examining how the data structures that enable what comes across in user interfaces can be understood and taught in the context of writing studies.

CHAPTER 1. WHY WE NEED DATA LITERACY IN THE AGE OF BIG DATA

1.1 Introduction

This dissertation explains why data literacy should be taught in college writing

classes along with other new media literacies. At a fundamental level, collections of data

are types of *compositions* that involve choices to include or exclude certain criteria. By

using the term "compositions" to describe collections of data, I am implying that they

may be understood as a form of multimodal writing. Like other forms of composition,

data compositions involve selection and combination processes wherein information

becomes tailored towards specific contexts, audiences, and purposes. In other words, data

are rhetorical. Writing has always involved the transmission of data, starting with clay

tablets in ancient times. However, in our present age, we must address contemporary

forms of data—including the massive quantities of computer-generated information that

are currently abundant via the Internet, often called Big Data, and we must develop

rhetorical knowledge frameworks around these forms. As writing teachers, we recognize

that "rhetorical knowledge *is* the basis of composing" ("WPA Outcomes"; my emphasis),

and that all compositions emerge within rhetorical, sociocultural infrastructures,

reflecting and communicating complex assumptions and preferences. The "Writing

Program Administrators (WPA) Outcomes Statement," identifies four key competencies

for all first-year composition programs across U.S. postsecondary education: 1) rhetorical

knowledge; 2) critical thinking, reading, and composing; 4) processes; and 5) knowledge of conventions ("WPA Outcomes"). I argue that information literacy, as a type of convention, must also be addressed, and it should address more than students' roles as *users* of data organization systems, such as libraries. Students should also develop basic a critical awareness of how data come to populate information systems in the first place. Within this broader definition of information literacy, students would understand how data arise out of systemic infrastructures. To this end, this dissertation argues that educators should emphasize *data literacy* as a specific type of literacy. Whereas information literacy involves strategies for using what is already given, for example, learning how to effectively use libraries for research, data literacy involves critical thinking about what goes on beyond interfaces—data literate individuals ask questions about why certain information has been presented in certain contexts and what happens with the data generated by user interactions.

To establish a rationale for teaching data literacy in writing studies, this project draws from a range of scholarly fields, reflecting a multidisciplinary approach that fits well within rhetoric and composition as a "dappled discipline" (Lauer). While hoards of literature on databases may be found in computer science textbooks and "how to" manuals designed for computer programmers, theoretical texts about databases that are situated in humanities fields have been fewer and further between. Scholarship in the broad and often ill-defined field of the Digital Humanities has included discussion of data and databases, especially in the form of textual analysis, however few scholars consider the concept of data and databases as objects of study in and of themselves apart from whatever other literary or historical topic is at hand. Exceptions include the work of Lev

Manovich and N. Katherine Hayles, who theorize databases in the context of their scholarship on new media. Other humanities-based exceptions include 1) the budding field called Critical Data Studies, spearheaded by geography scholars Craig Dalton, Jim Thatcher, and Linnet Taylor; 2) the work of education scholar, Robert S. Houghton, who advocates that using databases encourages higher-order thinking skills and proposes ways to integrate databases into elementary and secondary curricula ("Databases-teaching"); and 3) scholarship on "database literacy" situated in Film and Media Studies by Rahul Mukherjee, who surveys computer and information systems journals and popular articles from the early 1970s through the early 1990s to determine how data management systems practices became established (110).

Since the 1980s, the field of Rhetoric and Composition has addressed databases in various contexts, mostly with regards to professional writing. Proposing that working with data involves rhetorical strategies, Patricia Sullivan's 1986 dissertation, "Rhetoric and the Search for Externally Stored Knowledge: Toward a Computer Age Art of Research" is one of the earliest texts to address the use of databases. A decade later, Barbara Mirel's 1996 article, "Writing and Database Technology: Extending the Definition of Workplace Writing," centers on what I now label data literacy in the context of business writing. Also focusing on workplace writing, in 2005, Johndan Johnson-Eilola theorizes how data-related knowledge work becomes constrained by user interfaces in *Datacloud: Toward a New Theory of Online Work*. In these examples, rhetoricians mostly have focused on databases as workplace technologies. An expansion of this trend surfaces in "Toward a Civic Rhetoric for Technologically and Scientifically Complex Places: Invention, Performance, and Participation" by W. Michelle Simmons

and Jeffrey T. Grabill, who imply that understanding databases constitutes a critical literacy. In this article, they insist that

> writing at and through complex computer interfaces is a required literacy for citizenship in the twenty-first century. This literacy has many components. We must do a much better job teaching database searching, including understanding how databases work. We must do a better job teaching the critical literacies necessary to deal with authority and credibility of sources, and we must engage issues related to quantitative literacy. We don't have to teach math or statistics as they are taught in those disciplines; we have to teach students how to make sense of public information from our own subject position as citizens and to be able to write using multiple forms of evidence. And we certainly need to provide some experience writing computer interfaces, reports, public presentations, multimedia compositions, and other, mundane documents meant to communicate important information to public audiences. (441)

Along these lines, I argue that especially since the rise of Web 2.0 and its social media applications that employ massive data structures, we must consider databases and data structures as worthy of critical study. They are important, ubiquitous technologies that impact ordinary, every day computer-mediated interactions, affecting us in our roles as citizens, workers, students, and in nearly any other of our roles and identities.

Because it situates computer-related writing broadly, addressing aspects of Professional Writing as well as Composition Studies, the field of Computers and Writing is perhaps the most natural place to situate this dissertation in its study of data structures,

in particular because of how closely coding and databases are related. Coding, or computer programming, very often involves creating databases to store and retrieve user input; interactive computer applications rely on databases to store, read, and write information. While scholars such as Annette Vee and Karl Stolley write about coding as a literacy—building on the work of other scholars who have published in *Computers and Composition* since the 1980s—not much has been written yet on how databases are types of compositions in their own right. In "Understanding Computer Programming as a Literacy," Vee mentions databases briefly, acknowledging that they are built by computer code, and that their construction is related to computational literacy (46, 53). However, I argue that understanding databases and data systems need not fall solely under the umbrella of computational literacy or under what Mark Marino labels as Critical Code Studies. In 2006, he bases his definition of Critical Code Students on the assertion "that we begin to analyze and explicate code as a text, as a sign system with its own rhetoric, as verbal communication that possesses significance in excess of its functional utility" (n.p.) Instead of limiting the study of data literacy to one of these realms, it should be approached interdisciplinarily, incorporating research in Critical Data Studies (as discussed above), Professional Writing, Computers and Writing, and any other field of study that critically approaches data structures as cultural, writing-related phenomena.

Drawing from several areas of study, this dissertation establishes a definition of data literacy, introduces a feminist methodological approach to Big Data and data studies, and makes a case for teaching data literacy in first year composition and professional writing courses as a foundational writing-related literacy. Information written into and read from databases supports research activities in any number of fields from STEM to

the humanities; while different disciplines approach databases and data structures from diverse perspectives, all students need foundational data literacies.

1.2   Definitions and Key Terms

Data literacy is an understanding of how collections of data are compositions that involve rhetorical choices to include or exclude certain criteria. Data literate individuals understand and question the implications of data collection practices and possess basic skills in rhetorically analyzing and creating compositions that communicate effectively about data sets. In her discussion of computational literacy, Annette Vee discusses objections to the over-use of "literacy" to describe technology-dependent skills. After considering arguments from literacy studies, she advocates for defining skills as literacies based on their societal contexts. She proposes that "a literacy leverages infrastructural symbolic technologies and is necessary for everyday life" (45). Adopting this stance, I add that because data structures also have become infrastructural technologies that impact everyday life, like coding skills, data-related skills also constitute a valid form of literacy. Data structures impact how we think, work, and live, however, like coding, knowledge of how to create them has mostly been held by males from privileged socio-economic backgrounds, that is, mostly white men. This project of data literacy, then, is an intersectional feminist one that seeks to acknowledge how differences in women's multifaceted, situated identities can impact not only critique of data structures, but how new data structures are produced.

The term "data" alone has come to connote a certain type of information— discrete, objective, recordable, measurable, quantitative units; data are often thought of as

neutral facts, as objective evidence. However, when used in communicating arguments, data can never be "neutral" because they always arise within a rhetorical situation and include or exclude certain criteria that could draw attention to or erase any number of intersectional identities. In "Raw Data is an Oxymoron," Daniel Rosenberg observes that the word, "data," has not always meant what it means for us today—its connotations have changed over time. Rosenberg characterizes data as a Modern invention—Modern, that is, in the sense of historical period beginning roughly in the 1600s, when the word first appears in the English language. According to Rosenberg, the term surfaces in many usages and contexts in the 18th Century; for example, Joseph Priestley uses "data" to mean evidence not only from observation and experience, but also evidence from "trusted sources," such as the Bible (15). Discovering that it has different roots from both "evidence" and "fact," Rosenberg underscores that "data" ("datum" in the singular), a word derived from the Latin "dare" that means "to give," held a semantic function that was specifically rhetorical—it was "something *given* by the conventions of argument" (20 my italics). In other words, the original meaning of data indicates a dependence upon context, audience, and purpose as well as on specific exigences. Data has always been collected as part of larger information infrastructures, including but not limited to archives, library card catalogs, census records, internet use statistics, health and disease records, birth and death records, land records, and any other number of sets of information that track a wide range of phenomena.

Since the 2000s, the key term Big Data has become influential as extremely large data sets become more accessible and therefore influential especially in business-related and scientific fields, where it has become a hot topic for discussion since the early 2010s.

Definitions of Big Data abound, and the term is commonly capitalized, reflecting its

status as a specific type of information resource. In terms of its etymology, Rob Kitchin

and Gavin McArdle trace the key term to the mid-1990s when John Mashey, a retired

former chief scientist at Silicon Graphics, used it to describe the handling and analysis of

massive datasets (Diebold in Kitchin and McArdle 1). More specifically, as Kitchin and

McArdle explain, Big Data sets usually include certain characteristics, such as what has

been referred to as the 3Vs—volume ("consisting of enormous quantities of data"),

velocity ("created in real time"), and variety ("being structured, semi-structured and

unstructured"). Yet, through their own research, Kitchin and McArdle determine that the

two most common characteristics of Big Datasets are velocity ("created in real time") and

exhaustivity ("an entire system is captured, n=all, rather than being sampled" as defined

by Kenneth Cukier and Viktor Mayer-Schoenberger) (1). As Kitchin and McArdle note,

the term Big Data often becomes used as a general catchphrase.

Precise ontological definitions of Big Data may be less important, however, than

the impact of Big Data as a concept. Cukier and Mayer-Schoenberger describe Big Data

as "more than just communication: the idea is that we can learn from a large body of

information things that we could not comprehend when we used only smaller amounts"

(*Big Data* 1). As Cukier and Mayer-Schoenberger assert, Big Data is "characterized by

the ability to render into data many aspects of the world that have never been quantified

before; call it 'datafication'" ("The Rise of Big Data" n.p.). Offering a more critical

perspective, danah boyd and Kate Crawford define Big Data as "a cultural, technological,

and scholarly phenomenon" that involves the computational power of technology and the

identification of patterns through analysis, which are then used to make claims. They also

assert that a great deal of mythology is involved in the Big Data phenomenon, pointing to "the widespread belief that large data sets offer a higher form of intelligence and knowledge that can generate insights that were previously impossible, with the aura of truth, objectivity, and accuracy" (662). While the mythology of Big Data implies that it can neutrally describe reality, data is and has always been rhetorical—situated within specific contexts, to support explicit or implicit arguments and purposes, and collected with specific audiences in mind. Taking these definitions of Big Data and data as starting points, the following sections define and explain the data-related phrases used throughout the dissertation.

1.2.1 Data Structures and Infrastructures

Data structures—a key term used throughout this dissertation—may be understood as specific ways of structuring data that emerge within larger infrastructures. However, the definition of data structure used here departs from the way the term is understood in computer science fields. As Lev Manovich points out, the standard computer science definition of data structure is "a particular way of storing and organizing data in a computer so that it can be used efficiently" such as "arrays, lists, and trees" (Black qtd. in *Software Takes Command* 201). Approaching the term a bit differently, Manovich uses data structure to conceptualize how various types of file formats store information. Whereas before, he explains, paints, canvas, or other materials were required to create a picture, software now simulates these hardware tools. He writes, "Instead of a variety of physical materials computational mediums use different ways of coding and storing information—different data structures" (*Software* 201). In particular,

he points out how digital imagining substitutes physical materials with only two data structures, the bitmapped image (a grid of pixels) and the vector image (mathematically drawn lines and shapes). Algorithms then work on these structures to modify their appearance (*Software* 201-202). Manovich uses the term data structure to mean one of the structures contained within a particular file format that can be affected by an algorithm, such as the separate vector and pixel systems used within a Photoshop ".psd" file. These data structures store information in different ways, constituting unique approaches to structuring data at the level of code. For this reason, Manovich calls them data structures.

My definition of data structure resembles, yet differs from both the standard computer science definition and Manovich's definition; instead, I use data structure as a more generalizable and portable term that transcends the material data structures involved at the level of computer code. I define data structures as systemic, material approaches to organizing information purposefully and visibly in ways influenced by and emerging out of larger, more invisible infrastructures. Susan Leigh Star and Karen Rohleder define infrastructures as having several qualities: "embeddedness," "transparency," "reach or scope," "learned as part of membership," "links with conventions of practice," "embodiment of standards," "built on an installed base," "becomes visible upon breakdown," and "is fixed in modular increments, not all at once or globally" (qtd. in Bowker and Star 35). When thinking about ways to store data, creators of data structures, whether or not they realize it, rely on socio-cultural-technological infrastructures to determine which categories and classifications of data should be stored. As I explain in "Women's Ways of Structuring Data,"

Just as infrastructures themselves are often invisible, women's roles within

them have been rendered even more invisible. Whether or not it has been

articulated with this particular vocabulary, a goal of feminism has been to

make visible the ubiquitous cultural, political, social, and economic

infrastructures and the roles of women within them. While infrastructures

are usually transparent, the structures created within them can be more

consciously designed. We can understand "infrastructure" to indicate a

large type of immersive and network-like system. The Latin prefix "infra-"

means that which is below the surface or foundational, and "structura"

relates to the process of building or construction. As "structures below the

surface," infrastructures may be of such a large scale that they are difficult

to understand or grasp as a whole and cannot be easily mapped. They are

not planned out in their entirety with a singular purpose, and they often

cannot even be pointed to physically. In contrast, the word "structure"

describes a smaller part of an infrastructure—one built, designed,

organized, or curated purposefully and visibly. ("Women's Ways" n.p.)

As a simplified, general example of a data structure that reflects larger

infrastructures, consider how a university tracks student progress by recording criteria

such as student name, ID, class, instructor, grade, and so forth. This database of student

grade information would have relationships with other databases, such as one that tracks

applications or financial aid. Administrators can run reports on any combination of data

fields and records across the individual databases. Data literacy involves learning how

data structures and their categories, standards, classifications arise from cultural or

systemic assumptions. For example, the "grade" field is included in this database because our education system expects teachers to assign a quantitative value to student progress. On the other hand, data literacy also involves the ability to question what criteria systems exclude—for example, my hypothetical database excludes a field for student absences because the system expects teachers to take that into account when determining grades. In addition, we could consider all of the other databases that are tracked through a university data structure using something as simple as a student ID card and student number as an index. Data gets stored each time a student swipes her ID at the gym, when she checks out library books, when she loads funds on the card to purchase meals. As a result, a large number of personal activities become tracked, creating not only a data footprint for each student but also a cumulative, enormous set of data for the entire student population, especially considering that this data could be collected over many years.

All of this data could be considered knowledge available for analysis. However, to further understand data literacy, we should consider Susan Leigh Star and Geoffrey C. Bowker's discussion of cataloging practices. Inevitably, certain knowledge becomes lost because it resists classification. Bowker argues that we need to perform "infrastructural inversion" in order to reveal the categories, standards, and classifications (ready criteria for databases and therefore easily understandable by computers) that already abound throughout society and culture (qtd. in Bowker and Star 34). Because we live in ubiquitous infrastructures that are invisible until "inverted," we need to look for and find the invisible and complex ecosystems of technology, politics, and knowledge production that make the world function as it does and shape the narratives that we live with everyday. Standards and classifications are produced by what are already considered to

be ways of knowing, and in turn, they influence the ways that people think and act and classify more knowledge. In other words, they have material-discursive force. As Nathan Johnson remarks in "Information Infrastructure as Rhetoric: Tools for Analysis," "Communication scholars need to start looking at infrastructure instead of through it. Investigating the rhetoric of classifications, standards, protocols, and algorithms is an important part of understanding modern rhetorics" (2). This dissertation responds to Johnson's call-to-action by recognizing that information infrastructures are fundamentally rhetorical; further, it argues that data literacy requires humanities-based expertise because data structures are imbricated within socio-cultural infrastructures. The following sub-section explains databases and data sets as they relate to data structures.

1.2.2 Databases and Data Sets

Databases and data sets are specific instantiations of data structures that have been designed or composed for specific contexts, audiences, and purposes. Almost any kind of information can be recorded in a database or data set; information goes into fields with specific parameters that limit what form the information takes, such as length, type, and so forth. The main difference between data sets and databases has to do with their level of organizational complexity. A data set can be something as simple as an excel spreadsheet —a data sheet—with a limited number of columns and rows. A database, however, records multiple sets of data and also tracks relationships between entities or objects. Data sets may be extracted from databases as reports through queries, such as those enabled by SQL (Structured Query Language). In relational databases, data sets can become tables that are linked to other tables through key fields.

To understand how data structures, databases, and data sets relate to one another, look at the Purdue library information system as an example. At a broad level, the data structure of the Purdue Libraries resembles that of other libraries and includes the standards, classifications, and categories usually expected—ways of listing author names, call number systems, for example. Like other university library data structures, it includes a card catalog database and a range of archival databases that index the physical materials housed on campus. The library data structure also provides links to other subscription-based databases, such as periodicals and scholarly publications, from which materials can be digitally accessed. Each database within the overarching library data structure has its own standards and classifications. When a user queries a database to find something specific, a list of search results can be considered as a data set. For example, if I am looking for women authors in Early Modern England, I may search the EEBO database (Early English Books Online) author field for the name Mary, and the search returns a list of works written by people named Mary, with titles, dates, and digitized images. That list is my data set, which I could add to by performing more searches on women's names.

Contemplating the ways that we read, work with, and understand databases can lead us to question how they may be culturally analyzed. Manovich claims that computer databases, along with 3-D navigable spaces, have become new cultural metaphors to "conceptualize individual and collective cultural memory, a collection of documents or objects, and other phenomena and experiences" (*The Language* 214). Manovich recognizes that collected data is not passive—it must be generated, categorized, and indexed. Noting that our current age provides us with too much information and not enough stories to make sense of it all, he explores the points of contrast between

databases and narratives, claiming that the two are intrinsically opposed forms of knowledge. Responding to Manovich's database-versus-narrative argument, Katherine Hayles also points out that our postindustrial society relies heavily on databases and interpretations of them. For example, on a global level, database management systems have become essential in the tracking and analysis of large-scale phenomena like economic trends or climate change. Yet, when we talk about data, we inevitably tell stories about them, encapsulating data analysis into easily comprehensible forms. She writes, "No longer singular, narratives remain the necessary others to database's ontology, the perspectives that invest the formal logic of database operations with human meanings and gesture toward the unknown hovering beyond the brink of what can be classified and enumerated" (183). While Hayles spends significant time addressing the impacts of digital media for literature and art, she also attempts to theorize how specific types of databases, such as relational or object-oriented, map phenomena differently across time and space. Hayles's analysis of databases works toward developing a material-discursive theory about them. Databases, which are often behind the scenes and "invisible" to an application user, have rhetorical force, not only because of they reflect categories and classifications that emerge from rhetorical contexts, but also because they help to construct narratives within interfaces. For example, my Facebook profile has a collection of posts spanning several years. While the content of the posts, including pictures, who liked them, comments, etcetera, are stored as discrete data, when viewed as a whole, a narrative about my life emerges that chronicles what I have been doing over the past several years. However, all of these discrete bits of data could be taken together with data from other profiles and analyzed as a massive data set. Databases like those belonging to

social media applications, as well as others that deal with reporting public data, such as

the ones on Data.gov, are usually accessed through GUIs (graphic user interfaces). Visual

interfaces are not required to access data—its just that GUIs have also become an

infrastructural standard for accessing data in most online environments used by publics

with varying levels of technical knowledge.

Nearly all digital environments are facilitated in some way by databases. They

drive a range of web applications in ways that most users do not realize. On the surface,

only GUIs are visible, and sets of data could be presented in any number of ways through

them in the form of visuals, texts, and sound. It is important that students learn how data

structures influence what comes across in the interface. By having students rhetorically

analyze databases and then create them, composition teachers can help to demystify these

ubiquitous yet invisible technocultural objects. Becoming aware of data structures gives

students insight into how digital compositions emerge, empowering them to be more than

"users" or "subjects" that use technological "objects." Ideally, they would gain insight

into how both "sides" of this encounter arise in dependence on many contributing factors,

such as the standards, classifications, and categories perpetuated by techno-cultural

infrastructures. As Adam Banks recognizes in his discussion of race and the Digital

Divide, problems of material access to technology will exist unless fundamental

economic transformations occur in our nation. Yet, he also writes, "Beyond the tools

themselves, meaningful access requires users, individually and collectively, to be able to

use, critique, resist, design, and change technologies in ways that are relevant to their

lives and needs, rather than those of the corporations that hope to sell them" (41). In the

following chapters, I argue that data literacy will help create the conditions for this kind of meaningful access to technology.

1.3   Chapter Summaries

The remaining chapters create an extended argument for why we need to approach data literacy as a writing-related literacy that should be taught in writing classrooms.

First, Chapter Two establishes a socio-ontological methodology that shapes the qualitative methods used throughout the remainder of the dissertation. The chapter uses feminist, new materialist theory to build on the social-constructivist approach commonly found in feminist rhetorical methodologies. Integrating the work of feminist new materialist scholars with feminist rhetorical scholars, this socio-ontological methodology approaches technological entities as active participants in shaping and defining human experiences and identities.

Next, Chapter Three examines how the various mythologies surrounding Big Data require new, critical approaches to how we understand data and its impact on our everyday lives. Not only are employers calling for workers that are more data literate, but every Internet user needs to be aware of how their data becomes stored and used. Because data collection practices have become integral to several work-life spheres—education, business, and everyday social media interactions—data literacy is important for everyone.

Chapter Four pulls together discussions in composition pedagogy that help establish an argument for why data literacy should be taught in Writing Studies. The chapter discusses works by composition and rhetoric scholars that involves interfaces and

computational literacies, explaining how teaching writing with databases furthers data literacy at a fundamental level.

Building on the theoretical work of the previous chapter, Chapter Five discusses an initial attempt to teach databases as part of a composition curriculum that involves community engagement, including initial reflections on student learning outcomes and reactions to the database curriculum. The chapter then provides practical resources for writing teachers who wish to implement data literacy projects in their classrooms.

Finally, Chapter Six concludes the dissertation, assessing the impacts of this research and proposing future directions in which the research may be taken.

CHAPTER 2. A FEMINIST, NEW MATERIALIST METHODOLOGY FOR
RESEARCHING DATA LITERACY IN COMPOSITION STUDIES

2.1   Why Feminist New Materialism?

This chapter establishes a methodology for the dissertation, proposing a

theoretical approach that can be used to first interrogate how data structures function as

multimodal compositions and then also to situate data literacy pedagogy within writing

studies. The methodology proposed here draws from feminist, new materialist theory

arising mostly out of scholarship in Science and Technology Studies, but it also integrates

these ideas with methodological approaches from Feminisms and Rhetorics. The result is

a socio-ontological methodology that shapes the qualitative methods used throughout the

remainder of the dissertation. This feminist, new materialist approach is innovative

because it builds on the social constructivist paradigm commonly found in qualitative

methodologies (Teddlie and Tashakori 4). While Chapters 3 and 4 apply feminist, new

materialist theories to issues of data literacy in writing studies and higher education,

Chapter 5 uses the same framework to reflect on an initial attempt to teach databases in a

composition course.

A feminist, new materialist methodology fits this project because it helps to

illuminate the complex relation between humans and technology. Feminist new

materialism provides an alternative to social-constructivist viewpoints, which have

trouble envisioning technology as more than a neutral container for social forces. While

Actor-network theory (ANT) attempts to include technological objects or artifacts as actors or agents within sociotechnical networks, this perspective draws critique because it does not always adequately address feminist perspectives. In *Technofeminism*, Judy Wajcman acknowledges that ANT's "most controversial idea, that we cannot deny a priori that non-human actors or 'actants' can have agency, has helped us to understand the role of technology in producing social life" (39). Yet, she points out that ANT theorists often focus too much on observable interactions, failing to consider how the absence or invisibility of certain social groups—women, most notably—impacts how technologies evolve (41-42). To illustrate this point, she references Bruno Latour's *Aramis*, a story about a technological artifact functioning as an actant within its own creation. Wajcman explains that Latour's "account of Aramis's network is incomplete because it does not include the gendered use of a transport system" (45). Further, argues Wajcman, "Actor-network theory is more interested in delegation to 'actants' than in the inequalities that arise in delegations among 'actors' […] "By bracketing issues of sexual difference and inequality, mainstream technology studies fail to explore how technologies operate as a site for the production of gendered knowledge and knowledge of gender" (45). Ultimately, Wajcman recognizes that technological artifacts *embody* gendered power-relations (23). However, this description of embodiment functions as a metaphor, suggesting that technology is a type of body-like container. Even the term that Wacjman favors, "artefact," connotes a passivity implicit in her understanding of technologies. While she seems to appreciate the idea of recognizing technologies as active forces in socio-technical networks, she eventually falls back on the view that technological objects and structures are neutral containers for socially constructed viewpoints.

Another example of a social-constructionist view of social justice issues in the context of new technologies surfaces in a November 2015 event titled "Biased Data: A Panel Discussion on Intersectionality and Internet Ethics." The website tagline for the panel announces that three speakers will "examine how real world-biases and inequality are replicated and systematically integrated into neutral algorithms and databases" (n.p.). Whoever wrote the tagline for the panel discussion makes the assumption that computer algorithms and databases are indeed "neutral" containers for information, which then in turn can be biased and perpetuate inequality. Implied here is a very specific ontological and epistemological perspective on technology and Big Data. Specific instances of data structures or even search algorithms are considered primarily as human-controlled mediums or containers for content.

As an alternative, feminist new materialisms ask us consider how technology actively participates in shaping and defining human experiences and identities. This perspective can be found in the work scholars such as Karen Barad and Susan Hekman. When approached from these perspectives, we can begin to understand how data technologies do not merely passively collect information as a valuable reserve to be drawn on when it suits human needs; instead, we can understand data structures as actively participating in our experience of the world. This chapter establishes a feminist, new materialist methodological framework for a closer exploration of the relationships among data structures, communication practices, and social justice issues, specifically geared towards teaching these in college writing classrooms. The definition of feminism used here is specifically intersectional, seeking to acknowledge that women's identities and experiences are nuanced and layered depending upon multiple, situated perspectives

that cannot be reduced to any essentialist definition of what it means to be female or any essentialist notion of what it means to identify with a particular racial or ethnic group.

The following sections give an overview of feminist new materialism's theoretical background, discuss researcher positionality, and provide a narrative of my own developing interest in this research. Next, the chapter addresses scholarship in feminist rhetorical methodologies as being compatible with feminist new materialisms. The last section of the chapter proposes a socio-ontological methodology, which includes developing a related practice of contemplative mapping.

2.2   Theoretical Background

This section provides an explanation of the key issues addressed by feminist new materialisms, explaining how it arises out of feminist scholars' discontent with social constructionism after the linguistic turn that emerges with postmodern theory. In *The Material of Knowledge: Feminist Disclosure*s, Susan Hekman describes a recent and ongoing theoretical sea change whose principal characteristic is a rejection of linguistic constructionism (2). She claims that theorists from a wide range of disciplines find linguistic constructionism unable "to bring the material dimension into theory and practice," which unnecessarily constrains theory (Hekman 2). Two important issues in early postmodern theory—the power of language to construct reality and the related issues of power and identity politics—thus become complicated and challenged in particular by feminist, new materialist thinkers, who recognize both the importance of language and the social in perpetuating patriarchal injustices as well as the importance of materiality and the body as a determining factor for women's experiences.

To understand how this dynamic continues to unfold, it is necessary to first understand postmodernism as a theoretical movement. Postmodernism can be broadly understood as a reaction and intervention against the modern tradition of Enlightenment positivist thinking. Deconstruction, a reaction against structuralism, becomes a crucial component in postmodern thought because it challenges modern, rationalist ideas about language as communicating positivistic, universal patterns. Instead, even at the very level of words, or for Jacques Derrida, even at a deeper level—what he calls *grammatology*—meanings are always ambiguous and never fixed to linguistic signs. The deconstruction of language that arises in postmodern thought also reflects postmodernism's challenge to other structures—social, economic and institutional power structures in particular.

Postmodern thought highlights identity politics, exposing how individuals' gender, race, and class can be devalued by dominant cultural narratives presumed to be universally true and reflective of a fixed external reality. David Harvey explains, "The idea that all groups have a right to speak for themselves, in their own voice, and have that voice accepted as authentic and legitimate is essential to the pluralistic stance of postmodernism" (48). This opening of space for other voices manifests in many venues, prompting feminist theorists across a range of disciplines to challenge how masculine perspectives have shaped the production of knowledge. Postmodern feminism also attempts to reconcile how material bodies can factor so importantly in a theoretical framework that identifies language as the lens through which reality emerges. Taking up this issue, Judith Butler explains materiality and discursivity as relating to one another performatively. In Butler's terms, we have no recourse to a pure body, but every reference to a body is another construction of that body. She wants to "think through the matter of

bodies as a kind of materialization governed by regulatory norms in order to ascertain the workings of heterosexual hegemony in the formation of what qualifies as a viable body" (16). This view, however, has been criticized by other feminist thinkers as inadequate. As Hekman writes, "Feminists expressed widespread discontent with what they saw as Butler's privileging of discourse over materiality in her analysis of the body. Yet precisely how to avoid this theoretical stance remained unclear" (80). Because she helps to articulate a solution to this problem, this chapter focuses heavily on Hekman's work as a driving force behind its proposed social-ontological research methodology.

Hekman takes up Latour's "new settlement" key term as a means to reconcile materiality with discursivity. In *We Have Never Been Modern*, Latour argues that the flawed modernist settlement carries with it the "assumption that nature, society, science, and politics are and must be kept separate" (qtd. in Hekman 7). Hekman agrees with Latour's critique, and as an alternative, she proposes four versions of a new settlement that will reconcile the divide between materiality and linguistic constructionism. The first settlement emerges out of the philosophy of science tradition and includes the work of Latour and Andrew Pickering. The second originates in the work of analytic philosopher, Ludwig Wittgenstein. The third settlement involves a reinterpretation of postmodernism, especially the work of Gilles Deleuze and Michel Foucault, who deconstruct the discourse/reality dichotomy. However, the fourth settlement, or the feminist settlement, is the one that Hekman finds most compelling and clear (8). In the feminist settlement, Hekman finds feminist theories as particularly suited towards connecting materialism and discursivity, bridging the disconnect between first-wave postmodernism's emphasis on social construction and a contemporary concern for materiality.

In particular, as Hekman points out, Barad's concept of *intra-action* helps articulate this connection. Unlike the term interaction, intra-action indicates that there are no individually determinate entities prior to specific intra-actions; phenomena are not objects-in-themselves nor are they Kantian perceived objects—they are specific intra-actions between objects and measuring agencies (Barad 128). In this light, "discursive practices are specific material (re)configurings of the world through which the determination of boundaries, properties and meanings is differentially enacted" (Barad 148). Language and the material world, for Barad, are not two separate realms; language shapes the world and has material force. Accordingly, then, we cannot throw out social constructivism altogether, entirely discounting that language shapes on how we view reality, nor can we ignore how physical forces impact thinking and language. By shifting the theoretical basis of inquiry from pure linguistic constructionism to a methodology that recognizes its insights while embracing new materialisms, it becomes clear how what Barad calls "agential cuts" are neither wholly dependent on language or the intentions of any one particular actor. Rather, agency is distributed among several actors in any given situation. There are a number of influences that play into how any situation or problem is presented, which results in an onto-epistemological framing, or agential cut.

Illustrating key new materialist ideas, including agential cuts, Lucy Suchman's work considers the complex relations between humans and technologies. In *Human-Machine Reconfigurations*, Suchman approaches interfaces through a posthuman, new materialist theoretical lens. In particular, she argues that the "task for critical practice is to resist restaging of stories about autonomous human actors and discrete technical objects in favor of an orientation to capacities for action comprised of specific configurations of

persons and things" (284). Traditionally, the liberal humanist tradition has assumed that

individuals stand outside of, and are separated from, technology, machines, or artifacts

that they use. However, a more valid way of thinking argues that humans and machines

are mutually constituted through their intra-actions. Suchman writes, "Encounters at the

interface invariably take place in settings incorporating multiple other persons, artifacts,

and ongoing activities, all of which variously infuse and inform their course" (284). She

draws in particular from Barad's theory of agential realism, where "boundaries between

humans and machines are not naturally given but constructed in particular historical ways

with particular social and material consequences" (285). Whenever we identify an object

of analysis as separate from the networks or contexts in which it exists, we are making an

agential cut wherein a socio-material assemblage emerges. As Suchman notes, this object

of analysis can be "human or non-human or combination of the two" (283). Suchman

asks us to reconsider what counts as important actors or entities within an encounter

while also keeping in mind how it arises in dependence with the circumstances that shape

and frame its identity.

Another useful term in articulating identities within what Hekman calls the new

feminist settlement is the term *disclosure*, which Hekman borrows from science studies

theorist Joseph Rouse. Rejecting the division between the natural and social sciences,

Rouse argues that "science discloses a world for us" but also explains that it does not

necessarily assert "a given concept of nature" (Hekman 91). Importantly, however,

Hekman builds on this idea, stating that the term can be used to express the new

settlements' argument: external reality is not fixed, but it *does exist* as more than a

projection from the discursive realm. She writes that external reality "is a product of

agents' interaction in a shared environment with a world that emerges through that interaction. It is an intra-action between knowledge and the world, not a one-way movement either from the world to our concepts (mirroring) or a projection from the discursive realm onto the world (construction)" (91). Further, Hekman insists that the concept of what it means to be a subject should be revised. Her "ontology of the social" draws on the work of Andrew Pickering, Foucault, Barad, and others to depict subject as mangles—a result of not only the discursive or the material, but as a result of the intra-action of multiple forces, including what society defines as qualifying as a subject (93).

Hekman realizes, however, that understanding the subject presents the greatest difficulty in an ontology of the social. While a subject is a mangle of different discursive and material factors, reality becomes *disclosed* by concepts, including through the ways in which a person understands his or her own position as a subject (107). Different subject positions disclose different realities, but we should claim neither that this occurrence leads to relativism, nor that one subject experiences a truer version of reality. Instead, we must compare how different disclosures result in different material consequences and make ethical value judgments accordingly. In this way, disclosure asks us to be forward-looking, attempting to evaluate how specific discursive framings will result in material consequences that entail ethical, sociocultural impacts. Disclosures matter in a number of situations, including those involving research. The way I understand this theory goes something like this: my subject position as a person who has experienced white privilege my entire life may severely limit my ability to understand how someone with an African American identity views any given situation. According to the socio-ontological theory outlined above, neither of our lived experiences of reality is

"truer" than the other's, yet the material realities of systematic racial oppression in fact do exist . Therefore, it is my responsibility to make ethical decisions to disclose reality in a way that contributes towards beneficial material consequences, i.e., to create material-discursive framings that work against systems of oppression. It is also important to emphasize that my definition of feminism acknowledges identities as complex and layered. An individual's identity and experiences can never be fixed and categorized because they arise from her material-discursive situatedness—as a woman, as an African American, as a Muslim, as a member of the LGBTQ community, as someone from a working class family, or depending on any number of connections that she has. New materialisms acknowledge that different subject positions arise simultaneously and overlappingly.

Because their research also deals with ethical, material-discursive framings, the views of Patricia Sullivan and James Porter on researcher positionality are useful to consider here. In *Opening Spaces: Writing Technologies and Critical Research* Practices, a text situated in the discipline of Computers and Writing, Sullivan and Porter "advocate a view of research as a set of critical and reflective practices (praxis) that are sensitive to the rhetorical situatedness of participants and technologies and that recognize themselves as a form of political and ethical action" (ix). Modeling their theoretical framework after feminist methodologies, Sullivan and Porter seek to move beyond traditional positivistic and naturalistic approaches within empirical research while incorporating postmodern theories especially with regards to mapping methodological positions. They write, "Our critical practices perspective sees methodology for the study of writing not as a rigid set of structures to be applied without question to a set of writing phenomena" (9). For them,

methodology is heuristic. They view research in writing as situated and practical rather than as producing epistemic knowledge. Breaking from an understanding of methodology that has pervaded much of rhetorical and composition scholarship, Sullivan and Porter instead see methodology as a set of research practices, as rhetorical theories that guide the application of particular data collection and analysis methods. They write, "Methodology is not merely a means to something else, it is itself an intervening social action and a participation in human events. It is itself an act of rhetoric, both with our participants in research studies and with our colleagues in a given research field" (13). Because research methodologies are foundationally rhetorical—arising from complex and changeable rhetorical situations—the roles of "researchers" and "participants" and the "rhetorical situation" itself are subject to a variety of complicating factors. Sullivan and Porter recognize three of them: "(a) The paradigm accepted by the researchers goes some of the way toward constructing what the research/ers mean/s by 'participants'; (b) the type of data being collected goes some of the way toward constructing what the research/ers mean/s by 'participants'; and (c) identities of 'participants' (and 'researchers') are not stable over time" (31). In other words, how we disclose or own subjectivities determines the shape of our research and how it becomes understood.

However, Sullivan and Porter recognize how researchers are not always able to identify how they are situated within their studies while they are in the midst of conducting research, noting that sometimes this critical self-reflection requires time (99). Regardless, as researchers, it is both possible and desirable to reflect on our own identities and sense of being stakeholders within our studies before, during, and after we conduct them. This sort of self-reflection on identity, subjectivity, and the recognition of

that it brings of the researcher-subject not so much a discrete, fixed subject, but as a myriad of intermingling interests and experiences, shaped by material realities, is crucial in avoiding an unnecessary gap between researchers and the issues researched. As feminist rhetorical scholars Jacqueline Jones Royster and Gesa Kirsch point out, researchers are never impartial observers; their scholarly interests and concerns are shaped and motivated by their own life experiences. In the following section, I discuss how my own life experiences have shaped my interest in data literacy.

2.3 Research Narrative

Here, I provide a narrative example of how my own interest in this project has been shaped by material circumstances, life experiences, and what I have encountered in my studies. How I understand my own identity contributes to my intra-action with what I frame as my research subject of data literacy, which in itself can be viewed as a mangle of various elements (the complexities of data literacy are explained in Chapter 4). One of the reasons that I think teaching databases in the context of composition studies is a worthwhile endeavor is because my experiences with them have shaped my own digital literacies. In this section, I provide a general narrative overview of these encounters and reflect on how they have informed my feminist methodological approach to this research.

I encountered databases for the first time in 1994, after I graduated from college and began doing administrative work for non-profit organizations. As you can imagine, databases are important for organizations that communicate with many clients, volunteers, supporters, and staff. In my first few jobs after college I used databases minimally; I knew just enough about them to update contact information and print out

mailing labels—those sorts of everyday office tasks. At that time, I did not think too much about them. A decade later, after I had my two children, was a stay-at-home mom for a while, and went back to work, I encountered databases again when I worked as an administrative associate at the University of Michigan. The department I was in had a Microsoft Access database that didn't work very well. It was confusing. When we asked it to print mailing labels, it worked okay for the most part, but every now and then it would randomly print four labels for one person. So I took it upon myself to figure out why and to fix it. That's how I started to learn about how databases work, how tables are relational, how to build more tables to collect more specific information and link them to existing tables, and how to make forms for data entry. I took a class on Microsoft Access through the U-M's employee training center, but much of what I learned came from playing around with the software on my own, reading the program manual, and experimenting. I was able to make our department's contact database more efficient and usable. At the same time, I was doing data-entry work for our new content management system website that was driven by data tables, and I saw how the content of the Center's web pages emerged out of an underlying data structure.

About ten years later in life, I became a PhD student at Purdue University and engaged with databases in a graduate course taught by Nathan Johnson. We built databases using PHP with a Cake framework while doing extensive reading on infrastructures. At that point, it really struck me how much of what we experience in digital media is driven by underlying classifications and structures. For example, if we want to make a collection of data, we first have to decide on the categories of information are important enough to be collected and how these categories should be connected or

structured in relationship to each other. Because of my work on a feminist project in Patricia Sullivan's Modern Rhetorics class, and also because of my work on Peitho Journal, which centers on Feminism and Rhetorics, I began to ask question about how women are impacted by data. These included: Why are some data considered important and others not? How do data infrastructures exclude women's voices? How could they be organized differently in order to reflect feminist principles? Working with the coding language PHP to make databases from scratch helped me to see how categories must be programmed into any data structure. Inspired to learn more about coding, I decided to learn another coding language and framework on my own—Ruby on Rails, which also uses databases to store the information that is displayed in interactive apps. It became clear to me: the ways that data are categorized and structured are rhetorical, and they impact how and what is perceived in the interface. I decided that it was important to interrogate data infrastructures from a feminist perspective.

These encounters have been important to me as a scholar and researcher not only because they have helped me to understand databases and infrastructures, but because they have been crucial in shaping my disposition and orientation toward technology on a broader level. My workplace experiences with databases peaked my curiosity in the Purdue graduate class, which fueled my interest in this dissertation topic. My learning about data structures was a sort of literacy process that also contributed to my broader digital literacies, such as being extremely open to learning to teach with different software programs, helping my students to create apps from scratch, and learning to code. My openness towards learning and teaching new technologies was in part shaped by my past experiences, for example, the time when I recognized that I could understand how

computers worked beyond the user interface. In my job at U-M, designing even simple interfaces in Microsoft Access allowed me to see how data structures feed into what users ultimately see. My openness toward technology came about because, largely through these work experiences, I began to feel confident and empowered that I could understand it. Instead of being some foreign realm of knowledge that only the "IT guys" (and yes, in my work experiences, they were always male) could decipher and troubleshoot, computer interfaces became something that I could understand and shape myself.

While I did not see the relationship between data structures and interfaces as a type of complex composition at that time, I now articulate this connection as important and view it as an area that needs further study. I also maintain that we need to be able to work with understand digital spaces beyond what application developers design for us and give us as finished products. Given the underrepresentation of women in technical fields, it is especially important for women to feel confident that they can shape the technology that they use and engage with it beyond a surface level.

Here, I have disclosed how I understand my own subjectivity as arising in relationship to a number of different material and imagined actants, explaining my investment in this topic. My subjectivity as a researcher is shaped by all of these factors, which contribute to the complexity of my identity. Feminist, new materialist theories contribute to understanding research methodologies as much as they provide a useful lens not only through which to analyze the material and ethical impacts of interacting with and composing data structures—topics that this dissertation explores in later chapters. First, however, this chapter continues by articulating how feminist new materialisms have the

potential to open up additional methodological spaces within composition and rhetoric; it does this by drawing from the theoretical developments in Feminisms and Rhetorics.

2.4   Integrating New Materialisms Into Feminist Rhetorical Methodologies

A notable work in feminist rhetorical scholarship, Royster and Kirsch's *Feminist Rhetorical Practices* proposes a framework for feminist research grounded in a social constructivist view of language and rhetoric. Skillfully summarizing and building on an entire body of research in Feminisms and Rhetorics, Royster and Kirsch identify several common themes, offer four specific strategies for inquiry, and consider a range of "leverage points for data gathering, analysis, and interpretation" in feminist rhetorical methodologies (148). Their thematic frameworks include: "symphonic and polylogical patterns of inquiry," "textually and contextually grounded analyses," "local analyses connected to global enterprises," and "an ethics of hope and care linked to responsible rhetorical action" (148). Specifically feminist "strategies for enabling robust inquiry" expounded on throughout the book are "critical imagination, strategic contemplation, social circulation, and globalization," while leverage points include "sociopolitical impacts on content and context" of "gender, race, ethnicity, status, and geographical sites" that impact rhetorical decision making in "rhetorical domains, genres, and modes of expression" (148). Royster and Kirsch develop these frameworks while recognizing that they engage in "studying rhetoric as a very much embodied social practice" (141).

In discussing possible sites of rhetorical engagement, Royster and Kirsch bring up the concept of cyberfeminism briefly. Cyberfeminism expressly focuses on how patriarchal, discriminatory power dynamics are perpetuated in online environments. In

the age of Big Data, these issues are especially pressing because data structures influence women's experiences. Royster and Kirsch touch on Mary Hocks's "Cyberfeminism Intersects Writing Research," summarizing that it warns against "the possibility of replicating sociopolitical biases and issues in yet another environment" (144). Hocks draws from the sociology of science, where much of cyberfeminist theory originates, relating it to writing and rhetoric. She provides a series of questions to keep in mind while encountering digital texts:

> Who has power? How can we get it?
>
> What/who is invisible? What is/is not transparent?
>
> Where do readers and authors find the pleasures of
>
> writing/reading/performing?
>
> What institutional infrastructures work for and against these pleasures,
>
> pushing against bodies that must live in time and space? (Hocks 250)

Importantly, Hocks claims that cyberfeminism highlights a need to bring cultural critique into digital rhetoric, a sentiment echoed by Alan Liu, albeit he gears his argument toward the digital humanists in general when he argues that they should build advocacy work into the mainstream humanities (497). While a goal of my project is to bring cultural critique into data literacy, methodologically speaking, it becomes more productive to view digital communication as more than socially constructed. Hocks' questions are valid and important; we need to look for what is invisible and become aware of power dynamics and the impacts of infrastructures. New materialist theories, however, take these questions a bit further, addressing how non-human forces actively shape how sociopolitical ideas emerge and circulate. For example, data literacy would help

individuals to understand how a database is more than content kept in a neutral container; the structures themselves make demands on users to divide phenomena into categories and classifications.

While social practices undoubtedly factor as important in feminist rhetorics, material considerations are equally important. However, feminist rhetoricians seem stuck on referring to rhetoric as an "embodied social practice," possibly because they want to signal an investment in social-constructivism while still recognizing that bodies matter. Because of historically shifting paradigms in rhetoric and composition, in particular with the arrival of the postmodern movement, scholars in rhetoric and composition largely have emphasized the social nature of writing, avoiding an expressivist axiology that views writers as cut off from their audiences as well as a current-traditional axiology that fails to take the social into account. As an extension of, but not a replacement for, social constructivism, the methodology proposed here suggests that feminist rhetorics could be re-situated as social-ontological practices or as onto-epistemological practices, putting equal weight on the social and the material. This view would implicitly acknowledge that bodies are not defined primarily by language and that a material reality exists that participates in how we experience the world as well as in how subjectivities are disclosed. Consequently, rhetoric is not foremost an embodied social practice but a social-ontological practice, which implies that it is already embodied. As Hekman argues, the benefit of recognizing different disclosures is that we can make ethical decisions based on the impact that those disclosures have on material consequences. Such a shift in feminist rhetorical methodologies, expanding them from the social to social-ontological, should not difficult to make. In fact, even though they do not articulate their views as new

materialist, two of Royster and Kirsch's inquiry strategies align particularly well with new materialist theories: critical imagination and strategic contemplation.

Royster and Kirsch articulate critical imagination as a feminist inquiry practice, recognizing imagination as a valuable tool in the research process. They define it as "a mechanism for seeing the noticed and the unnoticed, rethinking what is there and not there, and speculating about what could be there instead," remarking that Royster, who first develops the term in *Traces of a Stream*, "sees in this view the potential advantage of opening up our critiques, taking into account the murky and mysterious as well as that which is easier to document and know" (20). They also underscore the importance of "listening deeply, reflexively, and multisensibly" as a part of critical imagination (21). Their second proposed inquiry practice, strategic contemplation, relates closely to critical imagination. It involves reclaiming the scholarly genre of meditations, where researchers take "the time, space, and resources to think about, through, and around our work as an important meditative dimension of scholarly practice" (21). They argue that strategic contemplation can be useful when researching women's experiences in particular when "traditional, more publicly rendered sources of information are in short supply" (21). Strategic contemplation, according to Royster and Kirsch, also allows us to recognize how our own "embodied experiences" impact our research and how networks of women and their scholarly work have contributed to our own work (22-23). Both of these strategies for inquiry emphasize feminist practices of listening, contemplation, silence, and withholding judgment without jumping to conclusions or assuming too quickly that we know our objects of analysis.

We can investigate, however, what it would mean to take the feminist rhetorical practices of critical imagination and strategic contemplation to a level beyond the socio-linguistic. Feminist scholars appreciate the value of rhetorical listening (Ratcliffe), understanding that insights may come just as much from what has not been said or from what is invisible as they come from what is explicitly said. However, a social-ontological rhetorical practice would go beyond listening for what is said or not said; it could potentially change the focus from language to a deeper, non-hermeneutic level of awareness. Sources situated in rhetoric and posthumanist theory can help to illustrate how feminist rhetorical contemplation strategies may start pre-linguistically, adding possibilities to how inquiry practices can happen within this proposed methodological framework.

2.5   The Uncanny Spaces of Socio-Ontological Methodology

Building on Royster and Kirsch's research inquiry practices of strategic contemplation and critical imagination, this section draws from posthumanist currents in rhetorical theory to work through the fundamental materiality behind encounters and develop a socio-ontological research methodology. To this end, this section incorporates Diane Davis's views on rhetoric. While her subject does not explicitly involve research or research methodologies, in *Inessential Solidarity: Rhetoric and Foreigner Relations*, Davis explores the material conditions that precede symbolic representations. These ideas can be useful in articulating the concept of *intra-action*, thereby illuminating the process through which agential cuts occur. Underlying much of Davis' argument is Levinas' philosophy of the encounter with the face of the Other, which establishes both self and

other simultaneously in that the self must respond to the other. Countering Stephen Mailloux's hermeneutic, postmodern argument—that there's no way to encounter the "other as Other" because we assimilate everything foreign into our preexisting knowledge structures—Davis argues for a level of rhetorical relationality that goes deeper than that of hermeneutics. In a hermaneutic context, learning takes place through refiguring what we know so that our systems of understanding appropriate and incorporate new information. Drawing heavily on the theoretical work of Emmanuel Levinas, Martin Heidegger, and Francois Lyotard, Davis explores a view that does not discount the encounter with other as Other. She writes, "Inasmuch as the Other is not a phenomenon but an 'enigma,' the experience of the encounter is not a positive event that you could later grasp but a withdrawal of meaning, a 'disturbance' in cognition, as Levinas puts it" (75). She cites Lyotard, who points out that the encounter with the other disrupts cognition, interrupts the ego, which often immediately recovers due to habitual hermeneutic systems of understanding. Davis does not deny that rhetoric has an important hermeneutic function, but she importantly illuminates "a nonhermeneutical dimension of rhetoric not reducible to meaning making, to offering up signs and symbols for comprehension" (67). She asks, "What theoretical and analytical practices might emerge if it were admitted that rhetorical identification, for example, is at work prior to and in excess of symbolic meaning, prior even to the symbolic distinction between self and other" (2-3). The methodology that I develop here attempts to answer Davis's question about what theoretical or analytical practices might emerge from a pre-linguistic rhetoric by contemplating how a recognition of pre-symbolic rhetoric could influence research methodologies.

Along the lines of what Davis proposes, we can say that in the moment of encounter, in this hermeneutic gap when we are at a loss for words, we experience a caesura, a pause, an epistemic rupture. For a split second, or however long it can last, there is only encounter. We may never understand what happens in the encounter, and as Davis notes, we may not even distinguish between self and other within its context. Eventually, however, we are bound to make sense of the encountered by categorizing it, fitting it within existing knowledge systems, understanding it in terms of what we already know about the world. Here, building from this encounter is where intra-action happens; the entitites involved arise out of it, mutually dependent on each other. For that split second of encounter when the hermeneutic fabric is torn... what happens in that space? Within this question, it is important to identify what may or may not count as an entity in the context of the encounter. To whom or what are we obligated to respond? Davis opens the possibility for "a 'nearly existential affectability, persuadability, responsivity' that require[s] us to reconsider what this 'language relation' involves and who or what might be engaged in it" (166). Do encounters happen with objects, ideas, non-humans in the same way? Can encounters happen without the Other/object being physically present in front of us—in other words, can encounters happen through media? Do memory and mental perception count as media? For example, when I see a picture of a person on Facebook, is this an encounter? When I see a picture of a cat on Facebook, is this an encounter? What about a mysterious dark-colored spot on my bathroom floor? … Some things fit into our knowledge systems more slowly than others. Only when we cannot immediately identify something, for example, a mysterious spot on the bathroom tile (Is it dirt? Is it a bug?), can the hermeneutic fabric of an encounter be torn.

In any case, the answer to the question is yes. Even digitally reproduced or imagined entities still participate in encounters. Supporting this claim is Graham Harman's summary of Latour's view that "all natural and artificial things must count as actants as long as they have some sort of effect on other things" (17). The more relational alliances, the more real the actant becomes. Integral to Latour's understanding of relationality is his concept of translation, which Harman describes as what is required in the link between actants (18), noting that every relation requires a translation (79). All humans, animals, objects and concepts (even cartoons) are equally real in Latour's view (albeit not equally strong), and all engage in translation. Harman explains how this translation happen in the absence of a separate independent reality to be translated by an object. Unsatisfied with Latour's explanation that all objects are "of the same breed," Harman seeks to "reintroduce a split between real objects and sensual ones," supposedly without reintroducing the nature-culture split (190). Rejecting Latour's total democracy, or "flat ontology" (207) of objects, Harman introduces the "Principle of Assymetry," which argues that "two mental images can never touch, and two real objects can never touch, but contact between opposite forms of objects always can" (208). Moreover, the relation between objects also becomes an object with a new interior (211). He gives an example of himself encountering a tree: the real Harman encounters the sensual object of the tree and the real tree encounters the sensual object of Harman (211). Note that he carefully chooses the verb, "to encounter," rather than "to perceive," which indicates that agency is not located in a human perceiver, but distributed among actants.

The encounter that Davis writes about is something akin to Latour and Harman's ideas of translation—two actors emerge within their relationality on an ontological level.

Hermeneutic or epistemic ruptures occur at first—but noticing them and their affective dimensions depends upon a mode of attention, or comportment—in the Heideggerean sense—towards them. If I encounter an entity with the assumption that I already know it thoroughly, then no awareness of a hermeneutic rupture occurs. Only when something strikes me in a particular way, can I begin to be conscious of the material encounter with it on an ontological rather than on a solely epistemic level.

Jane Bennett experiences an encounter of this sort when she is struck by an assortment of debris within a storm drain on a particular morning in June. She describes being struck by the vitality of matter as if it were speaking to her, provoking a reaction within her. She writes, "I was repelled by the dead (or was it merely sleeping?) rat and dismayed by the litter, but I also felt something else: a nameless awareness of the impossible singularity of that rat, that configuration of pollen, that otherwise utterly banal, mass-produced plastic water-bottle cap" (4). This encounter spurs her to continue thinking through vital materialism, or "thing-power"; she meditates on the various ways that inanimate things, assemblages, networks have agency and produce both subtle and significant effects. Contemplating the "thing-power" of data structures could help develop data literacies, but I give this example from Bennett as an example of how we could be aware of intra-action as it happens; the inanimate things are not passive, but grab and disorient Bennett as she walks by because they do not immediately fit into her knowledge system. They appear to Bennett as uncanny.

For Heidegger, "the uncanny" or "to damonion," literally the demonic (not the religious meaning of the word, however) allows us to glimpse Being. Abstraction and ordinariness become inter-permeable in the uncanny. Heidegger explains,

> The uncanny, as the Being that shines into everything ordinary, i.e., into
>
> beings, and that in its shining often grazes beings like the shadow of a
>
> cloud silently passing, has nothing in common with the monstrous or the
>
> alarming. The uncanny is the simple, the insignificant, ungraspable by the
>
> fangs of the will, withdrawing itself from all artifices of calculation,
>
> because it surpasses all planning. (101)

We may understand the uncanny as an affective comportment towards the world, a kind of meditative curiosity. Heidegger explains that the uncanny eludes empirical study because it "pertains so immediately to the ordinary that it can never be explained on the basis of the ordinary" (101). However, while we may not be able to study the uncanny as a phenomenon, it can still influence how we approach research methodologies as a thinking strategy for ordinary encounters. After all, Heidegger frames the demonic not as some kind of otherworldly exceptional state, but as a grounding for everything that is ordinary (102). He reminds us that ancient Greek thinkers incorporated the dynamics of concealment and unconcealment into their thinking—this older way of understanding truth draws attention to the ways in which Modern thought is pervaded by a rationalism that necessarily limits it. In contrast, the "primordial thinkers" Parmenides and Heraclitus, "do not 'take up' the beginning in the way a scientist 'attacks' something," but they are "begun by the beginning, 'in-cepted' by the 'inception'; they are taken up by and are gathered into it" (7-8). They were not founders of thinking; rather, the beginning in-cepts them because they paid attention in a particular way. Parmenides, through his encounter with the goddess, Aleltheia—the truth as unconcealedness that is wrested from concealment—properly experiences "the conflict occurring within the essence of truth"

(17). This conflict has been alien to Western thought, argues Heidegger, because for us, "truth" means "that which is beyond all conflict and therefore must be nonconflictual" (18), or, in the "modern metaphysics of Schelling and Hegel" truth is never unconcealedness but "certainty in the sense of certitudo, which, since Descartes, stamps the essence of veritas" (19). For modern thinkers, rational, certain, knowledge has become privileged, overshadowing the older kind of thinking that was the thinking of beginnings. Heidegger does not define "beginning" other than to explain that "in this early thinking, [beginning is] what is to be thought and what is thought," and he sets the thinking of the beginning apart from the sort of thinking that has to do with knowledge of the sciences (7). This approach involving defining and asserting truths through research has remained common in the ways that academics think and write about subjects such as science, data and technologies. Yet, if we are to follow the example of the primordial thinkers, then, thinking the beginning starts when one stops defining truth as *veritas*, as fixed knowledge capable of mastery, and instead as *aletheia*, or unconcealedness of Being, such that it continually withdraws. It requires an openness toward glimpsing the uncanny, the demonic, in what is ordinary or simple. Beginning-thinking is important to us now as we question the rationalist foundations of modernity and its legacy in contemporary thought as well as the postmodern reactions against them. It is also becomes important to developing a socio-ontological research methodology, where we can slow down and not assume we know what is happening in any given situation. Thinking beginnings can help researchers identify intra-action and agential framings.

Heidegger's perspective on thinking contributes to the social-ontological methodology that I develop here. Like Royster and Kirsch's inquiry practice of strategic

contemplation, thinking beginnings allows for meditation on meanings that become closed down when we too quickly think we have knowledge or mastery of something that we encounter. Moreover, the experience of the uncanny is imbued with a sort of murky and enticing affect, a sense of desiring to know a truth that continually withdraws, especially within what is ordinary. It is true that Heidegger never explicitly defines his ideas about beginning-thinking and the uncanny as primarily materially oriented—and in fact, he is known for his theory of language as the ground of Being, and he would not view thought as possible without language. Yet, we cannot deny that the sense of uncanniness that Heidegger writes about is present in the encounter that Davis describes as pre-linguistic. Also, beginning-thinking necessarily includes affective, and therefore material, dimensions that align with new materialist thought. By theorizing encounters as materially rather than as linguistically constructed at a fundamental level, we legitimize a set of values and investments—in the material, affective, pre-linguistic grounding of communication. These processes resemble what Royster and Kirsch suggest as a feminist rhetorical strategy for inquiry—strategic contemplation. With this approach, spaces open up for questioning everything that we think we know or assume, which can help to produce robust and ethical research that is attuned to the materiality of a situation.

Becoming aware of hermeneutic ruptures allows us to contemplate how disclosures arise, how agential cuts are made, and how what Barad calls an apparatus produces a specific social-ontological framing. Enacting this methodology, we might attempt to engage a research situation as much as possible with fresh eyes, attempting to assume that we do not already know what is happening. The point is not to avoid hermeneutic framings altogether because of course this would be impossible, but to try to

step back into a meditative space of a pre-linguistic encounter with Other(s) before re-incorporating the research situation into existing frameworks of knowledge. For example, Chapter 5 of this dissertation investigates what happens at a pedagogical level when students are asked to compose databases. In this situation, the researcher encounters more than one Other; the major actants comprising the research situation could be mapped out to include the researcher herself, the students, the classroom(s) and teaching equipment, the assignment sheet, the researcher's ideas of what databases are, the students' ideas about what databases are, assigned readings, database software, and other actants: human, technological, and imagined. Making such a map to understand the research situation would serve as a method not so unlike other qualitative research methods, such as the postmodern mapping methods that Sullivan and Porter advocate in *Opening Spaces* (77-99). They suggest representing the researcher within "research scene maps," which fits within a feminist, new materialist paradigm. As Barad makes clear, researchers are not "observers" but active participants in the ways that situations materialize.

Drawing pictures as a way of thinking beginnings can help us engage in the feminist rhetorical critical inquiry practice of strategic contemplation. I call this process "contemplative mapping," arguing that the symbolicity involved in drawing is different from the symbolicity of language and affords an alternative type of contemplation, a spatial and non-language-centered type of thinking, or as Rudolf Arnheim calls it, "visual thinking." Mapping research situations in this way becomes a socio-ontological method where we take time to reflect on the actual materiality of the entities encountered within a situation that we wish to investigate. Within a socio-ontological methodology, researchers approach research situations with a disposition of strategic contemplation, asking and re-

asking questions about what is going on without making assumptions and without reifying a subjective/objective split, thinking that the research situation is "out there" and existing somehow as external to the researcher. This set-up serves as the a research apparatus where the actants, including the researcher, only exist as they do at that particular framing in relationship to one another, not as separate, independent entities. As a researcher, there is no getting outside of the research situation, but the qualities of the situation, while seemingly ordinary, can be investigated through meditation as if it were uncanny, taking a mental attitude of thinking beginnings instead of assuming to quickly that we know what is happening in a given a situation. Rather, with this methodology, the particular material situation is fluid and disclosed by the way it is framed conceptually and through discourse.

As a socio-ontological method, strategic, contemplative mapping can help a researcher to recognize her own research apparatus and be aware of her own participation in the research situation. For example, in the map of my student's Celery Bog app community engagement project (Figure 1), I create representations of myself, my students, the community partner, the entities served by the community partner. In this case, because the map is made in Prezi, I have not tried to draw pictures. Most of the representations are words, but I have inserted some images. Whether or not I have specific research questions already in mind—and if I do, these could also be notated on the map—I consider how this apparatus discloses a material, yet fluid, reality.

This strategic mapping method helps researchers to overcome the urge to immediately identify and figure everything out and to master a situation immediately. Contemplative mapping slows down the process of analysis through stasis, but if this
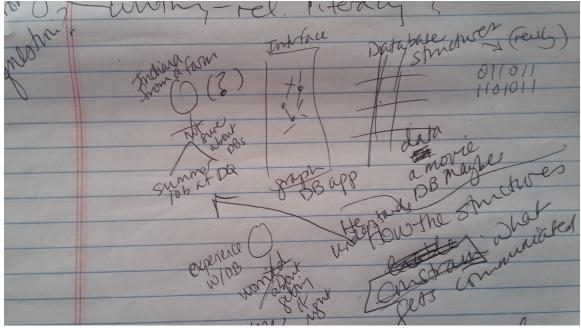
Figure 2. Planning a database assignment.

process is to retain a socio-ontological methodology, a researcher should also ask

questions that help her to engage in beginning-thinking, first experiencing a situation as

uncanny. Some questions a researcher could ask herself include: Do I really know what is

happening here? Who are these people / objects / animals / programs? How much do I

know about the self-identities and motivations of the participants? In what sorts of ethical

and material impacts may my particular framing or disclosure of this fluid situation

result? Commentary and thoughts on the research process, similar to the narrative style

that Royster and Kirsch demonstrate in their discussion of feminist rhetorical practices,

also are beneficial. At this point, it is useful to take up Hocks' cyberfeminist questions

presented in Section 2.4, in particular: "Who has power? What/who is invisible? What

is/is not transparent?" Her other questions seem less applicable—they involve how

women can get power and pointing out where readers and authors find the pleasures of

writing/reading/performing, including considering how institutional infrastructures work

Figure 1. Celery Bog Project Map.

for and against these pleasures. From my perspective, pleasure is not something that I

prioritize in a writing class, although when students enjoy assignments, they are more

eager to learn. Ultimately, however, the reason why these practices are considered

feminist stems not from any essentialist notion of what it means to be female, but from

the feminist tradition of inquiry that questions social power dynamics, looks beyond what

easily appears as evidence, and considers the unseen or invisible forces that impact any

given situation. Contemplative mapping that involves representing the research situation as a whole, including the researcher, should help develop our thinking about these questions.

Contemplative maps could also be used heuristically even outside of a research situation, for example, aiding in curriculum invention. If I want to think about possible projects to develop for writing curriculum that ask students to engage with data sets, I might start by drawing a map of how I envision this happening. In Figure 2, I imagine a student looking at an interface and then trying to understand how data works "behind" it. I draw myself into the picture as well, and contemplate who I assume the student to be (students have identities, obviously; they are never generic), how I am identifying myself in this situation (with whatever particular qualities I identify with at the moment), which software and learning strategies could be used based on my knowledge, and what I hope that students will understand by engaging in the project. Additionally, I should also look at the white spaces around my drawing and contemplate what sorts of things might be missing from my representation. Have I considered the important qualities of the learning context, for example what sorts of technology are available and practical to use? How might different student subjectivities impact their engagement with the material? What are my ethical responsibilities as a teacher? How can I incorporate more opportunities for cultural critique? The key for contemplative mapping is to try to engage in meditation on the situation, attempting to make it uncanny by not assuming we already know anything as a given. I try to remember the situation's fluidity, understanding that the diagram discloses only one specific framing among many possible ways of representing what is

happening. For me, the messiness of the drawing also reminds me that my own understanding is fluid and changeable.

This chapter has developed a socio-ontological methodology that combines scholarship in both feminist new materialisms and feminist rhetorical methodologies. I discussed the importance of researcher positionality and provided my own research narrative that explains my investments in the topic. The socio-ontological methodology developed here expands on social constructivist theories to view all participants in a situation, including non-human ones, as mutually existing in dependence upon each other. Within this framework, contemplative mapping helps to articulate how the researcher does not exist outside of the research situation and assists in helping to make the situation uncanny, so that we can question assumptions and think through processes. This method will be applied in later chapters. First, however, the following chapter considers why Big Data matters in contemporary society and why its popularity requires data literacy skills.

CHAPTER 3. ENGAGING THE BIG DATA MINDSET

3.1   Truth, Reality, and Big Data

The previous chapter develops a theoretical methodology that incorporates

perspectives from both feminist new materialisms and feminist rhetorical theory. This

chapter applies this methodology to explain why Big Data is so important in

contemporary society. The integration of data structures into our everyday lives though

computer interactions calls for data literacy as a fundamental skill. In 1996, shortly after

computers and the Internet started to become more broadly integrated into society

(although mostly among privileged socio-economic groups), the New London Group

argues that "the languages needed to make meaning are radically changing in three

realms of our existence: our working lives, our public lives (citizenship), and our private

lives (lifeworld)" (65). Here, I argue that we need to understand the language of data in

order to make meaning in all these realms. First, the chapter discusses how important it is

to understand the role that economics and business plays in the Big Data mindset; Big

Data is often used to support mostly profit-oriented arguments about truth and knowledge

in contemporary society. After discussing these arguments, the chapter provides an

example of how individuals may be impacted by data structures without even realizing it,

using socio-ontological methodology to illuminate everyday data situations. Finally, the

chapter reviews the work of several scholars in the area of Critical Data Studies,

recognizing that their arguments are essential for developing theories about and pedagogical approaches to data literacy.

To begin to understand the importance of data in contemporary society, and how, socio-ontologically speaking, data becomes an entity impacting every computer user's existence, we need to be aware of how businesses view data as a valuable resource for making predictions and increasing profits. Cukier and Mayer-Schoenberger argue that the correlation afforded by sheer quantities of Big Data can in many cases may be used to make accurate predictions, yet they recognize that this viewpoint cannot reveal much information about the actual causes behind phenomena. While those who rely on Big Data to provide accurate correlational evidence assume that when the sheer amount of data collected is large enough (the n=all argument), then corresponding correlations with other events may accurately reflect causation at least partially, they also recognize its limitations. Cukier and Mayer-Schoenberger provide the following example involving a delivery company:

> It places sensors on vehicle parts to identify certain heat or vibrational patterns that in the past have been associated with failures in those parts. In this way, the company can predict a breakdown before it happens and replace the part when it is convenient, instead of on the side of the road. The data do not reveal the exact relationship between the heat or the vibrational patterns and the part's failure. They do not tell ups why the part is in trouble. But they reveal enough for the company to know what to do in the near term and guide its investigation into any underlying problem that might exist with the part in question or with the vehicle. (n.p.)

This example shows how correlations drawn from Big Data can be useful for saving businesses money, and it serves as a practical example of why business want data-literate employees. It also shows how Big Data can be analyzed on a broad, superficial scale in order to pinpoint which phenomena may need to be researched more in-depth.

Business analysts may assume that massive quantities of data can describe truths about the world, however, there's a general sense that adequately explaining *why* things happen has becomes less important than describing *what* happens. This favoring of correlation over causation reflects what Cukier and Mayer-Schoenberger call the "Big Data mindset." In their nationally-bestselling book, *Big Data*, Cukier and Mayer-Schoenberger frame the phenomenon of Big Data a sort of zeitgeist, arguing that Big Data marks a major transformation in how we make sense of the world. Historically, they explain, society has valued causation (the *why*) over correlation (the *what*). However, the Big Data mindset requires that society "shed some of its obsession for causality in exchange for simple correlations" (7). Focusing on the *what* instead of the *why*, in their view, leads to better observations about the nature of reality. When we give up our need to explain everything precisely, claim the authors, through embracing "messiness," we will come to understand how things actually are. Further, they explain that "just as the telescope enabled us to comprehend the universe and the microscope allowed us to understand germs, the new techniques for collecting and analyzing huge bodies of data will help us make sense of our world in ways we are just starting to appreciate" (7). They write that "in the narrow confines of small data, we could pride ourselves on our precision—even if by measuring the minutiae to the nth degree, we missed the bigger picture" (48). By embracing "a sort of *n*=all of the mind," society can "strive to

understand the world from a far larger, more comprehensive perspective" (48). Instead of needing to explain exactly why everything happens, Mayer-Schoenberger and Cukier insist that in many cases, finding and acting on associations found in data may suffice because correlations alone often prove valuable—profits can increase because of new types of cost analysis and predictions facilitated by Big Data. A large part of this value arises due to "passive data collection" practices (101) or when banal information that has been collected turns out later to have special value (107). In essence, the Big Data mindset involves holding onto as much information as possible because it might become useful for as-yet-unknown secondary purposes down along the "Big Data value chain" (126).

With their emphasis on Big Data as informational capital, Cukier and Mayer-Schoenberger present many anecdotes from the business world and also reflect on the ways that Big Data may benefit other sectors of society—online education, for example. They explain that when enough students miss the same question or have to re-watch portions of lectures, teachers come to realize what they need to clarify (115). They mention how choices made in online gaming can indicate user preferences on a large scale (144). In addition, Cukier and Mayer-Schoenberger review possible negative impacts of data collection, such as privacy concerns and difficulties posed by a lack of ownership over one's own data (147). Despite their precautionary tone about the potential hazards of Big Data towards the end of the book, the authors overall outlook towards the future of Big Data and the Big Data mindset remains positive.

Such hype about Big Data has resulted in a new literary genre—what journalist Michelle Dean refers to as "pop-psychology-and-economics" books (n.p.)—national

bestsellers that use economic or statistical data to support interesting and novel arguments about why things work as they do, or why people act as they do in certain situations. Included in this genre, which may be collectively viewed as attempts to cognitively map human experience in relationship to technology, are Stephen Dubner and Steven Levitt's *Freakonomics* series as well as Malcolm Gladwell's *The Tipping Point*, *Outliers*, and *blink*. In these books, the authors notice patterns based on statistical or economic data and then tell stories about them. The stories draw readers in by providing plausible explanations for random questions. For example, one chapter of Dubner and Levitt's *Freakonomics* explores through statistics such research questions as, "Why do most drug dealers still live with their mothers?" In one chapter of *blink*, Gladwell creates a theory about why more tall men are in executive positions than short men. Judging from the wild success of this new genre, "pop-psychology-and-economics" books seem to be fulfilling a need among readers to better understand the world. Audiences are obviously interested in what data can reveal to us about why things happen or exist as they do. However, many of these stories that seem to explain the *why* behind phenomena are actually describing the *what* of phenomena. They use data correlation, not thoroughly investigated and rigorous causal evidence, to tell catchy and novel *why* types of anecdotes—and judging by their places on bestseller lists, audiences eat this material up.

In contrast, while it also narrates data stories, Nate Silver's *The Signal and the Noise* approaches Big Data issues from a more academically nuanced mindset. Silver, a statistician, relies on quantitative methods to make predictions, but he recognizes that "numbers have no way of speaking for themselves" and "we imbue [numbers] with meaning" (9). He discusses a range of predictions, providing examples of quantitative

forecasts that have failed because "we focus on those signals that tell a story about the world as we would like it to be, not how it really is" (20). Silver foregrounds a healthy skepticism about data, emphasizing that "there is the risk in the age of Big Data about becoming too starry-eyed about what [science and technology] might accomplish" (447). Silver's discussion involves more of a metacognitive awareness about data and storytelling than the more popular works mentioned above; he spends ample time reflecting on how preconceived notions impact the stories we tell about data, recognizes the difficulty of eliminating bias, and demonstrates more rhetorical awareness on the whole about how problems are framed and answers are provided with data as evidence. While Silver's approach may be more scholarly and may not quite fit into the category of pop-psychology-and-economics books, his writing has something in common with that genre—all of these works attempt to construct narratives around economic or statistical data that make sense of how human experience might be situated within technological infrastructures. These authors recognize that data only becomes powerful when we can tell stories about it. However, in order to know when these stories are accurate and based on sound data arguments, individuals need a certain degree of data literacy.

People involved in research situations—researchers and students, in particular—should be aware of how common understandings of data often take for granted a quantitative orientation, overlooking how the term may be used in qualitative research contexts. Annette Markham writes,

> As a research term, 'data' has been a problem for qualitative researchers
> for some decades now, not least because the term is — in most common
> usage — associated with some thing that one gathers, hence is a priori and

collectable. Data are potentially informational, yes, but as operationalized in most of the social or natural sciences, function fundamentally as discrete objects that can be located in time and space. The problem with this conceptualization is that it remains categorically different from — and in a sense opposed to — the very idea of process. From a qualitative perspective, 'data' poorly capture the sensation of a conversation or a moment in context. (n.p.)

Here, Markham articulates how popular connotations of the term "data" frustrate qualitative researchers; this point also underscores how "Big Data," implies that by the sheer quantity of evidence that they provide, data are able to give us snapshots of how the world exists at any point in time. However, this way of thinking results in a tendency to value correlation over causation, or as Cukier and Mayer-Schoenberger put it, "a move away from always trying to understand the deeper reasons behind how the world works to simply learning about an association among phenomena and using that to get things done" (n.p.). These two contrasting viewpoints reflect an ongoing methodological conflict in empirical research. On the one hand, qualitative researchers believe that accurate knowledge can be represented when data are collected through thick-description and ethnographic methods. On the other hand, quantitative researchers tend to value numerical, statistical evidence as capable of producing knowledge in and of itself. Danah boyd and Kate Crawford assert that the era of Big Data presents a challenge to research methodologies in general, warning that "there remains a mistaken belief that qualitative researchers are in the business of interpreting stories and quantitative researchers are in the business of producing facts. In this way, Big Data risks re-inscribing established

divisions in the long running debates about scientific method and the legitimacy of social science and humanistic inquiry" (667). They write, "Too often, Big Data enables the practice of apophenia: seeing patterns where none actually exist, simply because enormous quantities of data can offer connections that radiate in all directions" (668). Indeed, boyd and Crawford's observation of apophenia as a cultural practice calls for further exploration. We find ourselves in an era where, to quote Charles Aames, "eventually everything connects." In popular and business-oriented texts about Big Data, many authors provide a general sense that significant connections are bound to exist between phenomena, if only we can collect enough data and articulate the right linkages. A key component in data literacy involves negotiating this mythology and becoming aware of the limits and drawbacks of Big Data.

3.2   Everyday Big Data

Social media applications are all about telling stories—people inform one another about their perspectives and create collective narratives about the world—as demonstrated in applications like *Storify.* At the same time that these narratives are shared in software interfaces, social media companies collect a huge amount data behind the scenes. Facebook provides a good example of how interfaces and data structures relate, impacting users. As an experiment, I made a new Facebook account for my dog, Kahuna, who happens to be a male. Without me explicitly indicating the information about Kahuna's gender, Facebook somehow decided that the new user was indeed a male. Because it seems odd that male would be a default setting assigned to all new users, I assume that Facebook has an algorithm that looks up names from a list that matches them

with typical gender and assigns gender accordingly. When looking at the rudimentary profile I created for Kahuna, I make the following observations beyond noting what the design scheme looks like: Facebook 1) automatically assigns a gender, 2) prompts Kahuna to enter information about where he attended college, 3) prompts Kahuna to find friends and write an introduction, 4) provides an opportunity for Kahuna to give a status update, upload a photo, or record a life event. When typing in a status update, Kahuna has the opportunity to indicate how he is feeling by choosing from a dropdown list of emotions or by typing in his own description of his emotional state. To play along, I typed, "I signed up for a Facebook account. Woof! Woof!" and indicated an accompanying mood of "feeling excited" from the dropdown list of possible emotions (Figure 3). Each time I fill out a field and press "enter" or "post," the information that I share goes into Facebook's databases. Like other users, as I engage with the site, I may be aware vaguely that the application has databases to store what I input, but I am focused mostly on sharing and reading news and updates with my friends, not on how Facebook may or may not be analyzing the data that I provide. In actuality, Facebook has vast data structures that store every bit of data that we knowingly or unknowingly enter (including navigation patterns and clicks on advertisements). Facebook's data storage for its 1.65 billion monthly active users (as of March 31, 2016) includes a complex amalgamation of graph databases, servers and processes hosted in several different physical data centers across the country ("Company Info").
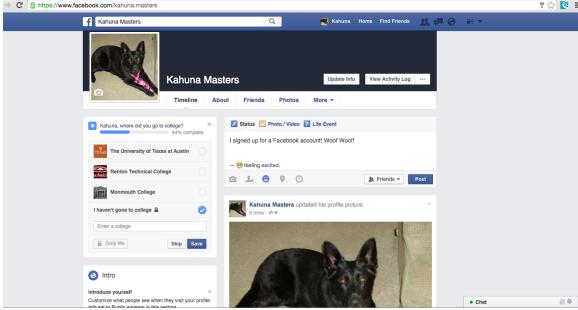
Figure 3. Screenshot of the "Kahuna Masters" Facebook profile.

If I have a basic understanding of how applications gather and store data—data literacy—I may consider who benefits from my information and ask questions about why Facebook has implemented the sharing of emotions feature that offers choices from a dropdown menu. A socio-ontological perspective asks us to look beyond a surface understanding of what happens between application user and the interfaces with which they interact, reflecting upon unseen power dynamics and invisible implications. In my contemplative map of the situation (Figure 4), I look at the ways that the interface is only a surface screen, in effect masking the more complex data interactions that happen in connection with what is displayed and what I input.
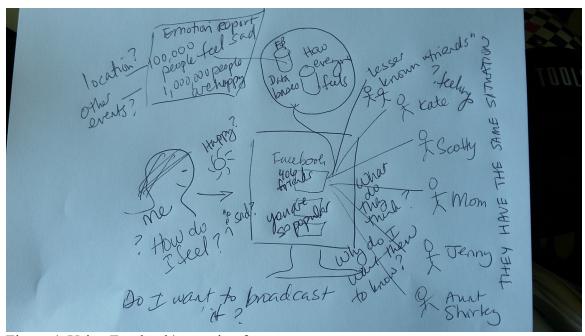
Figure 4. Using Facebook's emotion feature.

I might consider ways that the emotion feature does more than let my friends

know how I am feeling: In all likelihood, Facebook collects data on people's emotional

states in order to analyze it and provide "insights" to businesses. The dropdown list of

emotions to choose from indicates that one data lookup table provides the list of

possibilities, and we can assume that another one stores user selections in a manner that

can be quantified. Such information could be quite valuable to advertisers or government

entities who might like to analyze the nation's emotional climate against any number of

demographic data, geographic locations, and temporal information such as dates and

times that could be correlated with major world events. With a little research on

Facebook's company information pages, users can find out more specifics about the

company, including how developers can use graph databases and APIs for their own

purposes ("Facebook Developers"). However, most typical social media users probably

do not research the information infrastructures behind the apps that they use and remain

unaware of how their data becomes stored, compiled, analyzed, or sold. The same holds

true for any other computer application or interactive website. It is possible that networks

of businesses or government agencies, working with web app companies as consumers of

Big Data, could be shaping the structures that collect user data by offering to pay for

access to certain types of data, thereby impacting what we see in Facebook's visual

interfaces. However, privately owned companies are not required to be transparent about

their data management, analysis, and marketing practices.

Yet, as users become more data literate—when a person develops awareness of

the networks of entities involved in data collection practices—she may more consciously

choose what she communicates about her identity and share more discreetly. If users are

more aware of the data practices involved behind Facebook's interface, then they may

choose to censor or resist the data collection infrastructures set up within the app. From a

feminist new materialist viewpoint, the user and the interface mutually constitute one

another through their intra-actions. In the moment of inquiry, a Facebook user's

subjectivity depends on a mangle of factors, including her past experiences and material

circumstances, her role in the situation, and how she understands and reacts to the

application. An entangled dynamic emerges in the encounter between the application and

the user. When users gain data literacies—that is, they are able to understand how data

are collected through interfaces and then question the resulting cultural implications—the

way they interact with online applications and compose with web applications may

change significantly. For example, when I write a status, I purposely may refuse to record

my emotions with the dropdown list because I do not want to participate in this form of

data collection. Or, I may type in a nonsense emotion as an attempt to foil data collection

and resist Facebook's efforts to shape my online interactions. Alternately, I may want to record how I'm feeling using the feature, but I choose the first emotion that somewhat fits from the dropdown menu, rather than type in something more original. Researchers working for Facebook claim that the emotion dropdown feature contributes to their mission of connecting people, providing spaces for support and friendship (Burke and Develin). Yet, while these authors may be well-trained as researchers by top universities, they also are paid employees of Facebook, concerned primarily with promoting the benefits of Facebook to its users. While Facebook likes to come across as openly providing data—it gives developers instructions on how to use its APIs and use graph searches—Facebook's informational website also reports government requests for information ("Government Requests"). Facebook provides neither a comprehensive nor a transparent account of how its data may be mined and for what purposes.

3.3   Critical Data Literacies

Mining Big Data—that is, taking huge data sets and applying mathematical formulas to them so that they become intelligible—usually requires computational skills. Nonetheless, because billions of people march their digital footprints into Big Data collection structures every day, we need to develop fundamental literacies around how data are collected and analyzed. On an academic level, humanities students and scholars should have a degree of literacy regarding how Big Data could impact their learning and research. boyd and Crawford argue that this situation

> sets up new hierarchies around 'who can read the numbers', rather than recognizing that computer scientists and social scientists both have

valuable perspectives to offer. Significantly, this is also a gendered division. Most researchers who have computational skills at the present moment are male and, as feminist historians and philosophers of science have demonstrated, who is asking the questions determines which questions are asked (Harding 2010; Forsythe 2001). (674)

Because of these challenges, boyd and Crawford recognize that educational decisions need to be made, including whether students should be trained more interdisciplinarily, so that they are capable of integrating both computational and social research (674). Indeed, data literate individuals should know how to do more than crunch numbers—they need training in the humanities and social sciences that allows them to think about the complex methodological issues connected to data. This situation goes both ways, however, as Elizabeth Losh argues. She reflects on the need for digital humanities projects to not miss out on data strategies used in other fields, stating, "…enthusiastic hyperbole about our nascent abilities to collect information about data at this scale may mask the technical difficulties of creating interpretative frameworks in the humanities which synthesize very large quantities of cultural information" ("Nowcasting" 287). While responsibility for data literacy education should not fall into any one university department, the degree to which humanities should be responsible for technical education is up for debate. In any case, most interested parties would agree that all university students need to be able to analyze the rhetorical contexts out of which data sets emerge and effectively communicate about them. I argue further that because men and women are not currently represented equally in hi-tech fields, as they encounter more and more demand to be

versatile with Big Data, our next generation will need to address the ways that inequalities that could be perpetuated within information infrastructures.

Taking on these concerns, a robust approach to data literacy would resonate with themes in the emerging field of critical data studies. As a developing field, critical data studies draws from social science disciplines that use large data sets to do research. As geographers Craig Dalton and Jim Thatcher argue: "'Big data,' as a technology, is never a neutral tool. It always shapes and is shaped by a contested cultural landscape in both creation and interpretation" (n.p). Dalton and Thatcher caution that when Big Data is seen as only serving only instrumental purposes, we miss "its underlying epistemological effects." Instead, they say we should ask: "How is 'Big Data' as a form of technology enabling and constraining our culture and our lives?" (n.p.) Linnet Taylor adds to this discussion, drawing attention to "the radical asymmetries of power and technology that shape Big Data's production." She urges that it is "necessary to examine the unevenness in the way that born-digital data are produced, collected and manipulated" (n.p.). In addition, Taylor expresses concern that too much emphasis may be placed by funders of Big Data research on using it as an instrument for business profits, which could potentially lead to privacy and ethical concerns. As an alternative, she advocates for less instrumentality and more interdisciplinary and trans-disciplinary research that is also more culturally inclusive. Taylor writes:

> One role for critical research on data, then, is to de-instrument people and
> sensitise them to the diverse contexts of data's use and production. In
> contrast, a lack of attention to this diversity makes it possible to flatten out
> data's difficult unevenness, and inevitably diverts attention from the way

data may serve certain populations at the expense of others, or channel

resources to some places at the expense of others. For a data studies to be

critical, it also needs to become more global. (n.p.)

For data literacy to be a useful skill, then, it should also be a critical literacy that attends

to cultural concerns. If one has data literacy competencies, it means that he or she can do

more than analyze and communicate about data sets. Data literacy involves critical

awareness of how data sets arise in rhetorical contexts. A robust approach data studies to

also involves being able to engage in cultural critique of data creation processes. The

framework of critical data studies provides opportunities to engage with systemic gender

and racial inequalities that are too often ignored in pop-psychology-and-economics books

about Big Data. As we have seen, many arguments about Big Data are instrumental and

pragmatic, largely emphasizing data as a resource to be mined for the improvement of

efficiency and business profits. Such a view of Big Data situates it as an extension of a

larger technological project, reifying the assumption that technology is a neutral tool,

divorced from culture and social justice issues. Technological advances, including the

affordances of Big Data, perpetuate social inequalities because they are embedded in

larger socio-cultural infrastructures.

For decades, scholars concerned with gender and technology have been

challenging assumptions about the supposed neutrality of technology. With the rise of the

World Wide Web in the 1990s, arose also discussions of what it means to be gendered in

cyberspace. As Sara Diamond argues the "bad gender habits" of male-dominated

employment sectors such as computer science, engineering, and high-finance, "have

transferred to new media" (82). Also in the 1990s, now well-known feminist scholars

such as Donna Haraway, Anne Balsamo, N. Katherine Hayles, Sandra Harding, and Sherry Turkle begin to make waves on subjects related to gender and technology, along with a host of authors anthologized in works such as *Wired Women: Gender and New Realities in Cyberspace* and *Processed Lives: Gender and Technology in Everyday Life.* These collections and others highlight the complex ways that gender and social identity play out in popular new media spaces. In 2004, sociologist Judy Wajcman writes her seminal *Technofeminism*, which argues that regarding "technology as neutral, but subject to possible misuse" will blind us "to the consequences of artefacts being designed and developed in particular ways that embody gendered power relations" (23). Despite all of this thought and reflection, however, even in the 2010s, women are still disproportionately represented in STEM fields. Once women do make it into tech-related industries, they routinely face harassment by male colleagues both at work and online. These issues have been publicized by activists such as Samantha Blackmon and Alex Layne, as well as other writers for the website, *Not Your Mama's Gamer*, who in turn receive their share of hateful comments, mostly by men who refuse to acknowledge and take seriously the systemic inequalities that abound in tech-related environments. The many challenges facing women who work in tech fields still need to be addressed, which is why getting students to think about data literacy is important. We need to open up as many spaces as possible for students to work through complex issues of gender, power, and technology to promote ethical action in contexts outside of the classroom. Again, and always, we can come back to Hocks' questions: Who has power? What is invisible in this these situations? How will the ways that I am engaging with computer interfaces and technological systems impact myself and others beyond what I see in front of me?

This chapter has provided a foundational understanding of why data structures have become important to our professional and personal lives. It explains the public fascination with Big Data and exposes the ways that individuals can be affected by data collection practices. The following chapter builds on this argument, extending it to the ways that writing studies can address data literacy.

CHAPTER 4. DATA LITERACY IN WRITING STUDIES

4.1   Databases and Writing Pedagogy

The most effective way for students to understand how data becomes collected, stored, retrieved, and transmitted involves students actually working with data and attempting to perform these tasks with databases. Critics of teaching databases in writing courses may argue, however, that since databases are mostly used for quantitative, scientific information processing and analysis, instruction in how to work with them should be left to other departments such as computer science or information studies. While writing teachers routinely encourage students to use existing databases such as library card catalogs or archival collections for research in writing assignments, the idea of teaching writing with database software may seem puzzling to many. When writing teachers think of databases, they may associate them with scientific analysis or mathematics, deeming them incompatible with the genres normally taught in a composition course. As with the idea of teaching coding as a writing-related literacy, there are bound to be critics. This chapter discusses how the data structures that enable what comes across in user interfaces can be understood and taught in the context of writing studies. This context of writing studies, however, is quite broad, encompassing a range of different courses. For example, the scope of undergraduate writing instruction at Purdue includes first-year composition, advanced composition, professional writing,

business writing, technical writing, and so forth. Where, then, is the most appropriate

place to teach data literacy? I argue: all of them. All students need to understand how data

impacts their research practices as well as their everyday computer-mediated interactions.

Chapter 5 provides more discussion of pedagogy geared towards specific types of writing

classes, while this chapter focuses on the ways that writing studies already addresses

concepts that strongly connect with databases and data structures: in particular,

scholarship on interfaces, coding, and business communication strategies.

4.2   Interfaces in Composition Studies

Most students probably have little direct experience with database software, even

though they unwittingly engage with databases through user interfaces all the time when

they use social media apps like Facebook, Twitter, Instagram, and Snapchat. However,

while database software applications are foreign to most students, as Daniel Anderson

observes, exploring new technologies can be extremely beneficial for developing

literacies. He writes, "Unknown technical things create ideal situations in which literacy-

enriching problem solving activities might play out. Further, entry-level technologies

with simplified interfaces, limited feature sets, and broad availability can ease the way

towards innovation" (43). Anderson recognizes that simpler technologies may be more

appropriate for the uninitiated, but he also acknowledges points made by Bradley Dilger

and Stuart Selber that we must maintain critical approaches to even easy-to-use

technologies (43-44). Of course, different varieties of database software applications are

widely availabe, from Microsoft Access to graph databases like neo4j. Those with more

elaborate graphic user interfaces (GUIs) are easier to use in teaching composition classes because there is a smaller learning curve for both instructors and students.

Because GUIs are what students see when they write with computers, this topic provides a good starting point for getting at how the data "behind" or "beyond" interfaces impacts students as new media writers. In their influential 1994 *Computers and Composition* article, "The Politics of the Interface: Power and Its Exercise in Electronic Contact Zones," Cynthia Selfe and Richard Selfe frame computer interfaces as "linguistic contact zones," arguing that educators should not assume that computers are inherently beneficial in composition classrooms. Their argument builds on what Gail Hawisher and Cynthia Selfe referred to in 1991 as an overly positive "rhetoric of technology" (55). Selfe and Selfe insist that teachers take a critical and reflective approach to using computers, in order to "identify some of the effects of domination and colonialism associated with computer use so that they can establish a new discursive territory within which to understand the relationships between technology and education" (482). They identify computer interfaces as non-neutral borders that reinforce dominant cultural viewpoints. Cultural mapping, they argue, is a method to reveal the ways in which capitalism, class, gender, and race pervade computer interfaces. By becoming aware of the ideological nature of interfaces, teachers and students can critique and also help to influence alternative interface designs in the future. Selfe and Selfe briefly consider how hierarchical structures and logics carry over into interface design, acknowledging that underlying computer codes and structures are also ideological in nature. They discuss how computer interfaces, and to a lesser extent the structures from which they emerge, reflect cultural values; the authors call for more inclusivity, democracy, and non-

logocentric thinking in both areas. Selfe and Selfe underscore how all of the elements we encounter in software graphic user interfaces are culturally constructed, and they assume that users will embody certain norms—for example, the file folder icons on a desktop come from a business environment that has been associated with middle-class white males. As a response, they urge readers to become "not just users but critics of technology" (496), and they encourage teachers to bring this critical stance into their teaching practices. They suggest that

> we have to learn to recognize-and teach students to recognize-the interface as an interested and partial map of our culture and as a linguistic contact zone that reveals power differentials. We need to teach students and ourselves to recognize computer interfaces as non-innocent physical borders (between the regular world and the virtual world), cultural borders (between the haves and the have-nots), and linguistic borders. (495)

Selfe and Selfe would like more diverse cultural signifiers to be incorporated into interface design. They suggest that teachers can help de-colonize interfaces by rewriting them (495). This article is important because it draws attention to the ways that computer interfaces are not neutral. They carry messages that have the potential to act as colonizing forces on their users, perpetuating social inequality. Twenty years after Selfe and Selfe's article was published, the critique of interfaces remains a valid concern, and it is important for us to understand the cultural biases transmitted through them in a variety of contexts. Interface critique has been ongoing in composition studies since Selfe and Selfe published their 1994 article, which according to Google Scholar, has been cited by 417 other academic publications, mostly situated within Computers and Writing.

An important critique of Selfe and Selfe's article comes from Sullivan and Porter, who point out that interfaces do not necessarily have the same impacts on every student. As they remark, Selfe and Selfe present users as passively constructed against the hegemony of the interface (134). In contrast, Sullivan and Porter consider situatedness and strategies of resistance; they point out that power dynamics may change depending on the actual, situated interactions between technological interfaces and users (135). While Selfe and Selfe's article assumes that the symbols and language encountered by an interface user determine their experience with it, Sullivan and Porter's view suggests that users determine their own experience as they engage with interfaces. Emphasizing linguistic boundaries as fixed, Selfe and Selfe's article reflects an understanding of students as existing separately and distinctly from the technology that they interact with, while Sullivan and Porter's view indicates an understanding of material situations as in flux and gestures towards a human-machine assemblage, which aligns more closely with new materialist thinking.

Since the time that Selfe and Selfe published their article on interfaces, interpretations of human-machine interactions as fundamentally socially constructed have remained popular in new media composition scholarship. In her introduction to *Composing(media) = Composing(embodiment): Bodies, Technologies, Writing, the Teaching of Writing*, Kristin Arola and Anne Wysocki frame bodies as socially constructed even as theyattempt to incorporate materiality into their analysis, hoping that the book will "provide openings for exploring how the media with which [students] work encourage certain embodiments" (5). They often mention a "tension that has structured and continues to structure the field of rhetoric and composition" (11), which is the tension

between the feeling that one has an interior body full of subjective, meaningful experiences and an exterior body that communicates with others in a larger social system. Arola and Wysocki attempt, then, to bridge the gap between composition studies' expressivist and social constructionist camps by recognizing this tension and acknowledging that embodiment is both passive and active. What remains within this understanding of embodiment, however, is the view that humans are fundamentally, ontologically separate from the media that they compose with; composing subjects have interiors and exteriors, and they exist independently from technology. From this point of view interfaces and the databases that drive them would be seen as external socio-cultural objects that exist in tension with the subjective, "inner" experiences of the user.

To reframe interfaces and data structures in socio-ontological rather than social-constructivist terms would mean acknowledging how the materiality of interfaces arise as alongside of a user's multifaceted and complex understanding of their own subjectivity as they intra-act. As Suchman argues, interfaces are specific human-machine configurations or socio-material assemblages. What we view as an interface is actually an encounter within this assemblage. Encounters do not happen between discrete entities, black boxes, even though we may frame them that way. What happens in the encounter is that we have an opportunity to become aware of how all the baggage and history that shapes what we view as one side meets all the baggage and history that has shaped what we view as the other side. At a more fundamental level, perhaps "encounter," is not even an accurate word to describe what happens here; it is more of an entanglement with what we view as the object encountered. An interface, compositionally, spans beyond its design on a visual or interactive level as what we might interpret as the elements of user experience.

Interfaces also include the data architecture that support them at a structural level. We might envision data structures as the back-end of interfaces that demand specific kinds of information be collected. As a result, interfaces and their data structures necessarily privilege certain categories and classifications over others. On the other hand, however, the users that interact with interfaces and supporting data structures are also complex; the way a person approaches an interface may be influenced by any number of factors of identity and experience, as I emphasize in the previous chapter's Facebook example.

Ultimately, the goal of data literacy involves students understanding how data are not neutral, but rhetorically situated and that databases are types of new media compositions. The theoretical descriptions included above help to show how student responses are multifaceted and composition studies can broaden its axiological views, but they do not imply that we need to educate students at this theoretical level. Feminist new materialisms also can help instructors to understand the complexities of interfaces. By providing opportunities for students to encounter data structures beyond the interface, data literacy strategies in writing studies encourage a greater depth of rhetorical awareness of new media compositions. Learning basic databases through accessible software and understanding how they drive applications has relatively small learning curve and, like learning coding, allows students to encounter the structures that compose interfaces. I continue the next section with a discussion of coding and its connection to databases.

4.3   Coding and Databases

This section explains how database processes are closely related to the activity of coding. Another way of understanding data literacy involves looking at how data structures become created in the first place at the level of code. When making web applications, for example, how do we decide what categories and classifications of data should be collected and stored? On a surface level, we may think that what matters is to provide content in the graphic user interface and that's what writing online means, filling a visual interface with content. So whether that content is created from scratch using HTML and CSS as a markup language, or a different coding language such a PHP or Ruby, or a WYSIWYG (What You See is What You Get) software program, ultimately the point is to communicate something visually as graphics and text on the screen. But the actual structures that enable the visual content to be seen also matter greatly, have rhetorical impact, and fundamentally shape what is communicated and understood. In this case, writing becomes more than textual/visual artifacts but also depends on computer programming that incorporates data structures, that is, the ordering of stored information on the "back end." Data structures, along with coding, should be understood as essential to multimedia writing ecologies.

However, teaching computer programming in writing classrooms is no easy task. Elizabeth Losh comments on the institutional anxiety that surrounds teaching code, admitting that there are no easy answers to the question of who should teach computational literacy. ("The Anxiety"). As Brian Ballentine argues, digital humanists need "dedicated collaboration with computer science and technical communication in order to not be shut out of these important discussions (and our own interpretive

practices) because we do not have the language to argue in these spaces" (278-279). He cites Noah Wardrip-Fruin, who views computational processes as a means of authorship. He remarks, "Rather than defining the sequence of words for a book or images for a film, today's authors are increasingly defining the rules for system behavior," and he comments that processes may express things in their design that are not invisible to audiences (Wardrip-Fruin in Ballentine 279). Providing an example from his work in developing computer software, Ballentine explains how procedural literacy also requires code-level competencies. He claims, "Digital humanists interested in participating in the design, development, implementation, and/or critique of digital texts (in short, *all* the arguments) must be able to expand to the code level" (279).

Along these lines, Karl Stolley, a staunch advocate for coding as writing, insists that digital rhetorics expand to include the "intellectual work of programming," which includes acts of creation (as opposed to an approach that primarily engages software as texts for close reading). He states,

> For those of us who program as a crucial part of our research agendas, then, our argument must be proceeded by demonstrating that programming *as an activity* is genuine, humanistic inquiry that resists denigration with regard to more established knowledge-making activities grounded in the manipulation and interpretation of symbols. ("MVC, Materiality" 268)

He explains the MVC (Model-View-Controller) architecture used in many software applications to read and write information from connected relational databases. Giving an example of how to program a simple app in Ruby on Rails, Stolley shows how Rails, a framework for the Ruby programming language, uses ready-made source code to quickly

set up parts of the app instead of typing common features from scratch each time. For example, enteringa line of code causes Rails to automatically generate a database that tracks the properties related to User.

Typing instructions in a CLI (command-line interface) to create a database might seem quite simple, however, making an attractive GUI requires a lot of additional coding and markup. Still, Rails automates much of the work involved in programming. Stolley reasons that the automation afforded by Rails is not equivalent to other web authoring short cuts, such as WYSIWYG software, for a couple of reasons. In his particular teaching agenda, students at some point will write their own modules of ready-made source code. In addition, the automatic generation of code is entirely viewable in the command-line interface, serving as a pedagogical resource for students learning to program with Ruby. Stolley also points out how closely Ruby resembles written English, lending itself to easy customization and the composition of unique modules.

Many writing teachers would have a hard time teaching coding to the extent that Stolley practices in his classes. His vision of source literacy results in "a deep appreciation for the raw materials, the languages, of the digital medium, and seeing digital writing as more than the on-screen result of the machinations of commercial software" ("Source Literacy"). While I agree that digital writing should be practiced at the level of code to a certain extent, what matters more for the kind of data literacy that I advocate here has to do with understanding how code works rather than making elaborate programs entirely in source code. For the purposes of discussing data literacy, the structures enabled by writing in code are what we will focus on here. A key moment in Stolley's above description of creating a database sheds light on how these structures

become created and illuminates the rhetoric involved. Stolley types the following in the

CLI (command-line interface) to make a database for his model app:

> $ rails g scaffold User username:string firstname:string lastname:string
>
>   bio:text ("MVC, Materiality" 271)

Rails executes many more commands in Ruby from this line of code, creating the

database. The properties assigned to User are the most rhetorically interesting part of this

process. It is up to the programmer to decide what attributes to assign to User. In this

case, for the sake of demonstration, Stolley has decided that the person's first name, last

name, and bio will be included in the model application. "String" and "text" are field

types assigned to the defined attributes, and these determine how much space each entry

can take in the database. Database creators actively make choices that will shape all

future encounters and determine how users experience an application. The materiality of

writing comes down to such choices that in effect are agential cuts that have everything to

do with how a database author understands the rhetorical context in which the database

will operate. In turn, while created by a human author, the resulting data structure

determines what the application demands of its users. This application / data structure

becomes an entity in its own right that requires input. Database and database writer are

only framed as existing separately from the influences and conditions in which they arise.

It does not matter whether students write databases in source code or in Microsoft

Access for them to engage in the material-discursive process of writing databases. When

students make their own databases, they can use Ruby on Rails in the CLI, a commercial

application like Microsoft Access, or neo4j, a graph database whose advocates think

mirrors reality more closely than relational databases (of course, this claim is up for

debate). Instructors who want to teach data literacy with databases should choose which program makes the most sense for their particular situation. What matters most with databases is the material-discursive act of composition at the structural level, that is, the process of selecting database properties—the categories and classifications that will then be carried through into application interfaces. These categories are what users will see and interact with. If we contextualize Selfe and Selfe's initial argument about the politics of the interface in terms of today's database-driven web applications, it is easy to understand how the politics of an interface actually begin with a data structure—in programming terms, the M (Model) part of MVC (Model-View-Controller). The categories and classifications set up within the model prioritize certain data, making certain phenomena visible while excluding other phenomena, which remain invisible.

In the last section of this chapter, I shift gears a bit to cover another area of writing studies where databases factor as important, writing-related technologies: business communication.

4.4   Business Writing and Databases

In this dissertation's introduction, I review the ways in which Writing Studies has already addressed databases—most scholarship has focused on professional and business writing contexts. Chapter 3 recognizes how the business values placed on informational capital stir up much of the hype surrounding Big Data. While it is important to be critical of the ways that businesses can gather and exploit data, business writing teachers will also need to take the needs of businesses into account when integrating data literacy in to their curricula. On a broad level, data literacy involves understanding how data structures

impact communication through interfaces. However, more specific, business-based definitions of data literacy tend to center around employees' abilities to understand and analyze data, to draw strategic insights from it, and to communicate those insights to relevant audiences (Harris). This definition of data literacy primarily targets a business audience; Harris argues that "finding, manipulating, managing, and interpreting data, including not just numbers but also text and images" should "become an integral aspect of every business function and activity" (n.p.). Explaining that employers expect workers to not only create scientific hypotheses about data, but also think innovatively, Harris argues that businesses need more employees who can translate Big Data resources into profitable insights. Interestingly, twenty years before Harris defines data literacy, Mirel proposes that databases should not be ignored when considering the technologies involved in workplace writing. Mirel recognizes the need for employees to understand the nuances of writing reports on data, and she also recognizes the difficulties that teachers of professional and technical can face when they have little database expertise, but need both rhetorical and technological skills in order to teach databases. As a solution, she proposes more teaching collaboration between writing and computer science teachers (109). As evidenced by Mirel's article, the need for teaching data communication has been around for at least twenty years. I would guess that because interdisciplinary teaching is such a rare occurrence at universities, there have been few true collaborations across departments towards this end. Yet, I also argue that as more business writing teachers become more tech savvy, the general project of data literacy has special potential to flourish in these classes. Among all the genres taught in business writing, data-related texts have the greatest potential for expansion in the current age of Big Data.

In fact, Gemignani et al go so far as to label data products as *the* new texts to be critiqued and created. Approaching this process from a distinctly rhetorical perspective, *Data Fluency* claims that the ability to communicate about data requires a "rare skillset" including knowledge of one's audience, empathy for that audience, an ability to discern what's interesting from what's important, knowledge of basic statistical concepts, and an ability to interpret how data products will circulate within an organizational context (80-81). Writing studies experts will find these moves familiar because of the emphasis placed on the rhetorical situation and rhetorical appeals—context, audience, purpose, ethos, pathos, and logos. Gemignani et al report a great need for data product authors, but they find that academic programs have been slow to respond to this need. They remark, "Although data analytics and data communications is becoming a part of leading academic pubic health and education programs, a commonly understood set of prerequisites doesn't exist" (81). As an anecdotal example, they describe how one business intelligence director sets up the problem. This particular director, who works in the computer industry, reports that nobody at his company is qualified to design data dashboards; user-interface designers "weren't equipped to understand the data, and the data analysis weren't adept at presenting their results. In this gap, there needs to be a skilled data product author" (81). Such a predicament, where computational experts lack communication skills, and communicators lack computational skills, calls for an interdisciplinary solution to data literacy. The gap that Gemignani et al seek to fill with their book as a means of training could also be filled by college graduates who have gained humanities-based competencies in data communication and have also learned statistical or quantitative methods in any number of other fields. These humanities-based

competencies are currently taught in business writing classes, a situation that seems to elude the authors of *Data Fluency.*

While billed as a business guidebook, in fact, *Data Fluency* is all about business writing. The authors insist that organizations must master data communication strategies in order to remain competitive. "The language of data," according to the authors, is "a cold, lonely medium on its own." They write, "Data needs to be humanized and human-sized. It needs to be made relevant to the audience by being clearly linked to relatable problems. It should be presented in intuitive, visual, and simple ways. And like any language, data should be about conveying meaning" (Gemignani et al xxiv). *Data Fluency* provides a framework for assessing data literacy within organizations and for helping professionals to identify business insights through interpreting data analytics. Gemignani et al present their framework as a matrix—a square divided into four sections: the upper two quadrants are marked "individual" and the bottom two are marked "organization"; the left quadrants are marked "consumer" and the right are marked "producer." The resulting four boxes are illustrated with pictures of people in different roles "data consumer" (individual/consumer), "data author" (individual/producer), "data fluent culture" (organization/consumer), and "data product ecosystem" (organization/producer) (8). The book's chapters focus on each of these quadrants and also provide inventory quizzes and other exercises for organizations to assess and improve their employees' data fluency. Undoubtedly, the volume serves as a useful handbook for individuals who want to sharpen their organizations' data competencies, which would then translate into higher efficiency and profits.

Of additional appeal to business audiences would be *Data Fluency's* authors' backgrounds—they characterize themselves as business analytics experts, situating their work as consultant within the areas of business communication and data visualizations. Three of the four authors are economists; the fourth specializes in education and pedagogy. However, it becomes quickly obvious to those trained in rhetoric, composition, and professional writing that Gemignani et al rely heavily on rhetorical and technical communication principles to make their points. For example, in the chapter, "Data Products," they argue that "good data products" should follow a logical order, be "simple and uncluttered," and "use white space and have a clear visual hierarchy" (57). In the "Data Authors" chapter, they compare "data product authors" to writers—arguing that data authors must carefully consider their purpose and target their message to a specific audience. Gemignani et al write, "Data can both help explain how things are, and how they could be, but data becomes truly powerful when only when it informs, instructs, and leads to smart discussions, decisions, and actions" (79). Here, substituting the word "literature" or "oratory" for "data product" produces an argument similar to ones made by Aristotle and Blair centuries ago, when they wrote about the rhetorical purposes of these previous forms of discourse. Such similarities underscore how *Data Fluency*'s instructive messages about data communication overlap with the kind of expertise taught in writing courses that are grounded in rhetoric.

The sense of urgency around the need for workplace data literacy (a distant echo away from Mirel's original argument) indicates that professional writing programs still have far to go to meet the needs of workplace writing. After reading *Data Fluency*, I asked myself why companies are relying on economists to teach their employees about

business writing. If economists can teach about writing and rhetoric, making money by selling books on the subject, then surely writing teachers can teach students about data. Now that database technologies have expanded to include popular graph databases that show paths through data and claim to mirror reality, it is time for humanities-based business writing programs to offer more data literacy curricula. Ample opportunities exist to educate workplace writers on not only how they can use data to meet business objectives, but how they can do this responsibly and ethically. The following chapter presents ideas for fulfilling this goal, along with providing strategies for teaching data literacy in composition classes.

CHAPTER 5. PEDAGOGICAL IMPLEMENTATION

5.1 Overview

This chapter discusses an initial attempt to teach data literacy in a first-year composition classroom, which involved a scaffolded series of assignments designed to increase data literacy. Students analyzed data structures, created their own databases in Microsoft Access, and worked in groups to make functional databases for a community partner. After describing the trial curriculum, I discuss how the process of creating a database has material impacts on the community. I also reflect on the pedagogical impacts of the project and discuss ideas for future iterations of the curriculum. Finally, I provide a short, online resource for writing instructors who want to get started with teaching data literacy in their classrooms.

5.2 Trial Run: Databases in the Composition Classroom

During Spring 2015, I taught a course at Purdue titled, "Accelerated Composition with Community Engagement." This course, according to its official title, is "Accelerated First-Year Composition: Engaging in Public Discourse," is geared towards service learning and intended for advanced students. Below is a portion of the course description from the Introductory Composition at Purdue (ICaP) program website:

> FYC: Engaging in Public Discourse is an accelerated composition course
> that, like ENGL 10600, satisfies the Written Communication and
> Information Literacy requirements on the university core. In ENGL 10800
> students work with public writing and community service and can expect
> to engage in some local community activities outside the classroom.
> ("Course Information")

Connecting with this community emphasis, I chose a course theme of "Cultures, Communities, and Technologies," which comes the textbooks that I chose to assign, *Cross Currents: Cultures, Communities, Technologies* by Kris Blair, Robin M. Murphy, and Jen Almjeld. I had taught the course two times before, and while keeping many of the projects and short writing assignments similar to what I had taught in the past, I introduced a couple of new, experimental projects that required students to learn about databases. I felt that this class would be appropriate for learning about databases because of my experiences introducing new technologies into English 108 in the past when my students made a mobile nature guide app for the Celery Bog Nature Area. During that process, I recognized how much students learned when faced with making compositions in an unknown technology. Students gained experience creating multimodal compositions, while the Celery Bog Nature Area benefited from gaining a practical nature guide for visitors. The app also made use of a collection of pictures taken by a retired botany professor, which had been sitting in binders and not viewed much by the public. Since this experience was successful, I was open to asking students to engage with another new form of technology to create a functional composition for a community partner.

Building on this previous experience as an instructor managing student projects for a community partner, and because of my interest in databases as compositions, I looked for ways in Spring 2015 to gear the curriculum towards increasing students' data literacies while also making a practical database for a community partners as a form of service learning. These activities provided students opportunities to consider the relationships between culture and technology. Overall, the course outcomes are similar to a regular first-year composition class, except students were given opportunities to engage with their community and reflect on what it means to do this kind of service learning. These are the course goals that I tailored to this class and included in my syllabus:

> Most students who enroll in English 108 already have a strong foundation
> in writing academic papers, organizing written ideas, and conveying
> arguments in specific contexts. This course hones these writing skills
> while also providing a foundation in rhetoric, multimedia composition,
> and the principles of service learning. Students move beyond thesis
> statements and outlining techniques, focusing instead on writing as a
> means of thinking, as a way to critically process readings and ideas, as a
> method to communicate complex arguments through multimedia, and as a
> way to interact with the larger, local community. By the end of the
> semester, students will have a strong sense of their own writing style and
> experience greater confidence and ease at communicating ideas in a range
> of media. They will have improved their critical reading abilities, their
> informational literacies, their rhetorical awareness, and possess greater
> knowledge of their local communities. As students become more

competent in composing with multimedia, they also will learn to

interrogate technologies through a cultural lens. Students will read texts

that question the roles that media play in every day life, considering how

technology is culturally shaped and how culture manifests through

technology. Finally, students will learn about the environment outside of

campus as they participate in community engagement projects, which also

give them first-hand experience of how technology and culture permeate

local contexts. (Appendix)

To actualize these course goals, the assignment sequence involved three major scaffolded

projects related to databases, along with an ongoing digital journal (private blog) project

and a feature article that students wrote based on one of their journal posts. In addition to

textbook readings that we discussed in class and students wrote about in their digital

journals, students read a science fiction novel called Feed, a chapter on categories and

taxonomies from Intertwingled by Peter Morville, a chapter on data visualization by

Nathan Yau, and technical instructions on database programming, including The Manga

Guide to Databases. (See the syllabus in Appendix.)

The first major assignment of the semester, called "Web Analysis" (Appendix),

asked students to rhetorically analyze a data-driven, interactive website of their choosing.

Beyond straight rhetorical analysis of context, audience, and purpose, the assignment

required analysis of the website's taxonomy and visual rhetoric. Students were also

expected to discuss how cultural factors could have impacted the website's taxonomy and

comment on what sorts of categories the website excludes and speculate why. The paper

was to be written as an essay of approximately one thousand words. The writing process

for this assignment included a design plan, a rough draft, and a final draft. This assignment provides a foundation for the next database project because it gets students thinking about the categories and taxonomies involved in data structures. Presumably, they would apply this knowledge when they created their own databases. After I had read the rough drafts, however, I realized that our class discussions and activities on categories and culture did not impact student thinking in the way I had hoped. I wrote the following reflection in my blog:

> After reading student drafts, I realize that they are not going very deep into their analyses. I asked them to do better on the final versions. We spent a lot of time yesterday talking about cultural studies-related ideas, especially regarding gender norms in advertising. We also talked about how Americans have way more material possessions than people in most other countries, looking at pictures from the book *Material World*. [I included this mostly because some students chose to analyze commercial sites such as Best Buy and Macy's, but did not reflect on how these sites and stores are culturally-situated.] Students got it, I'm sure, but I don't know how well they will translate the ideas into improvements in their web analysis drafts and [include more] ideas about cultural norms and taxonomies. (n.p.)

Addressing these concerns helped to some extent. The more successful Web Analysis final drafts attempted to articulate ideas about cultural contexts but were not always successful. One student writes,

The taxonomy of IGN [Imagine Gaming Network] can also be directly related into cultural factors through its home screen. It seems almost that it asks the question, "What is trending?" as most social media does, and answers it through categorizing the most popular things to be visible first. Having this instant access upon entering the website shows the effect of cultural factors by representing that the most popular things in a certain culture, in this case the United States, are easily accessible.

Following the assignment prompts, this student recognizes that the audience consists of users in the United States and the context for the website includes other social media sites that hold "trending" to be a standard taxonomical category. Ideally, however, the student would have developed these thoughts further, remarking about *why* certain things are popular in certain cultural contexts. Another student writes about ESPN's website, focusing on how different versions of the site have been tailored for different audiences.

For example, the Brazilian and Spanish versions of ESPN has football, or American soccer, on their tabs, while the United Kingdom features F1 racing as a top sport and ESPN New York focuses on its basketball and football teams. Above this section, as seen on Figure 6, is a small scoreboard that rotates through the most recent scores of all major sports in action. Together these "tabs" allow users instant access to voluminous amounts of information in a small area of space, while maintaining the ability to allow the user to expand whatever information they find interesting.

Here, the student notices that localized, national versions of the ESPN website are tailored to the interests of people in different countries. Again, however, there is little reflection on why audiences may find some categories interesting as opposed to others and little consideration of why or how culture impacts categories and classifications. Both of these student examples, which come from two of the most successful Web Analysis essays, include rhetorical analyses that provide thoughtful discussions of context, audience, and purpose. They also address visual rhetoric. Each of these essays effectively demonstrates an awareness of how websites use taxonomies and classification systems in order to make their sites appealing to users. Yet, in both of these examples, students did not speculate much on cultural factors impacting how information is presented. To encourage more cultural reflection in the future, this assignment could be modified to require students to cite sources that deal with cultural analysis. The assignment could also be revised to focus more on how websites that they use collect data about them—in other words, it would get students to think about their digital footprints. Perhaps such a strategy would hit home with students because they may not have thought much before about how they create data when they use websites and how this data could be potentially used by corporations for profit. For example, in the future, I may design an assignment that asks students to track and analyze the data they communicate when using the internet. For a set period of time, they might be required to track the sorts of things that Google or Facebook would track, such as form inputs, searches, or even where they click when browsing websites.

Just as the first project did not go quite as I had planned, the second project, called "Database Project," had its own challenges. This assignment asks students to create a

database that tracks something of interest to them. The assignment has three parts: a design plan, a simple, small (20 primary records), relational database made with Microsoft Access or OpenOffice Base, and a reflective essay with data visualizations. The assignment has a few intended outcomes: to help build students' informational literacies, to help them understand databases as types of compositions that record and communicate about objects and processes, and to help them gain insight into "the technical, rhetorical, and cultural foundations of digital applications" (see the assignment sheet in Appendix). During the weeks that we worked on this project, we read or watched several sets of technical instructions and experimented with Microsoft Access. Students struggled the most in figuring out how to make their database tables relational, that is, how to link tables together, and how to make these tables accessible via forms within Access. Only one student made his database in OpenOffice Base instead of using Access. This student was an extremely self-motivated learner who sought out tutorials beyond what I provided to the class. Students also struggled to decide on what they would track in their databases, and the topics ended up ranging personal book, video game, or owl/trinket collections, to tracking systems for the concert venues or golf courses in which students had played. One student (the one who used OpenOffice Base) created a calorie-tracking database for his mother who wanted to lose weight.

On the whole, students demonstrated in their projects and reflective essays that they had accomplished the goals of the assignment. They were able to understand at a basic level how databases facilitate communication about data, including the important role that defined categories play in defining what can be said about any collection of data. For example, the student who wrote the calorie-tracking database writes in his reflective

essay, "The database project not only helped me understand the necessity of an efficient

system when tracking and creating relationships, but also helped me see, through the

visualizations, the implications of applying the system effectively: it made my mother

happy and motivated." This student focuses on efficiency and system effectiveness in his

reflection. Another student writes about the process of creating categories in her database

of the video games that she owns, stating,

> Being part of the video game culture, I understood that games could easily
>
> be sorted by a variety of factors. For example, gamers value knowing who
>
> the developers are for games, as it gives us certain expectations based on
>
> the developer's reputation. I knew I wanted to create a child table based on
>
> the platforms each game was played on, and I also knew I wanted to
>
> include the developers as well. Initially, I wanted to have genres as an
>
> extra table. However, as time went on, I realized that I was having a bit of
>
> difficulty classifying certain games into specific genres, and thus had to
>
> remove the genres table altogether. Thus, I kept only the developers table
>
> and the genres table for my future linked tables.

She decides to remove a genre table because it is too difficult to assign genres to them.

However, while she mentions that gamers value the reputations of game developers, she

does not reflect on why it was difficult to assign genres, which may have lead to

interesting observations about genre and video games. As with the previous example, this

student comes across as more interested in the practical uses of databases (or in

expediently finishing the assignment, which she later remarked was not enjoyable) and

less interested in meta-cognitive thinking about categories and classifications. While

these responses constitute only a small sample of student reflection papers, I tend to think that students may be unaccustomed to viewing technologies as objects of inquiry; rather, they view databases as means to an end product rather than something whose processes or components can be questioned theoretically. In other words, students view technologies like databases as neutral tools or containers for information rather than as structures that have material impact. In future iterations of the course, I will be sure to include more readings and discussions about technology as an object of study. Also, in order to emphasize the cultural aspects of technology, I will focus less on learning software and more on talking and thinking about categories and classifications, and drawing links between the readings and the database compositions.

Next, the final group project (see the assignment sheet in Appendix), constituted the community engagement part of the course. Through this project, students were given an opportunity to solve a community problem by using databases, and they were able to understand how data structures are not only theoretically important, but have real impact in the community. Students were presented with the following scenario:

> *As of January, 2015, The City of Lafayette, Indiana's Almost Home Humane Society has a new "Trap, Neuter, Return" (TNR) program designed to protect feral cats while also controlling their population in the local community. Feral cats are wild—they avoid human contact. When not spayed or neutered, these cats quickly reproduce and they can become a nuisance to people, especially in urban settings. The Almost Home Humane Society does not advocate euthanizing cats. Whenever possible, cats are offered for adoption, but feral cats are not adoptable as pets. The*

TNR program offers support to colony caretakers—citizens who feed,

coordinate healthcare for, and help to spay or neuter feral cats. It also

keeps track of the caretakers, tracking where they live and which

individual animals they are responsible for. Ultimately, in order to care for

these animals and assist volunteer caretakers, AHHS needs to track a

great deal of information. Like many not-for-profit organizations, however,

AHHS cannot afford to pay a consultant to write a customized information

tracking system or to buy a commercially designed database system.

Half of the students in the class were assigned to this project, while the other half worked

on a picture organization project for the Celery Bog Nature Area, in an effort to continue

the work of students in previous semesters. The goal was to streamline how a new

version of the app could use a large number of pictures. Students then worked in groups

of 4 or 5 on their respective projects. In order to solve the community problem presented

above, students studied and experimented with basic database design for several weeks.

After that, they worked in groups to develop a tracking system for Lafayette's feral cat

population that AHHS could put into use. To this end, two teams of four students

competed to see who could design the most effective database. Students interviewed an

AHHS manager, who collaborated with them to determine the best categories and criteria

for the tracking system, and they also researched a range of available database

technologies. The main relational categories of data and fields for each category are listed

in Table 1.

Table 1. AHHS database fields.

CARETAKERS	CATS
Name Address Zip Code Email Phone Date Started Number of Traps	Name Picture Primary Breed Secondary Breed Age Sex Fixed Fixed date Ear tipped Fixed by Rabies vaccine Date in Date out Zip Code Notes Recorded by

After conducting their own web-based and also considering what needed to be tracked in terms of categories and classifications, one group decided to design a database using a web-based database application on *Ragic.com*, and the other group decided to use Microsoft Access, integrating it with a mobile-app that would allow AHHS staff members to use the database while working in the field. While I introduced students to Microsoft Access, students did web searches and found the Ragic system of their own initiative, along with the mobile-app interface that works with Access. Here, they demonstrated excellent problem-solving skills and teamwork, figuring out that it was also possible to actually show maps of the cat colonies' geographic locations in the Ragic interface. After reviewing students' group presentations, AHHS decided on the web-based system that the one group of students had developed in Ragic. AHHS staff gave our class feedback that this system was easier to use and manipulate than the one designed with Microsoft

Figure 5. Ragic database created by students.

Access. They also liked the mapping feature. The group that chose Ragic ultimately had better assessed AHHS's needs for ease of access to the system while in the field.

The relationship between caretakers and cats is one-to-many: each caretaker has many cats assigned to them. The database easily allows staff members to produce reports, which are required by the City of Lafayette, and to visually view on a map where each caretaker-cat colony is located. Overall, the AHHS staff were quite happy with the new tracking system that composition students created for them and expected that the system would benefit the organization by assisting administrative staff in carrying out their jobs. Figure 5 contains a snapshot of the Ragic group's final presentation, where they explained the choices they made when designing and composing the database.

Over the course of this project, students learned about their local community, about how to create data tracking systems for real world situations, and about the realities

of how non-profit organizations operate. They also gain practice working on teams, creating presentations, and communicating the value of their work to others. Composing databases becomes a type of multimodal composition practice that benefits the community off-campus. Further, students developed data literacies and understood how data emerges at an infrastructural level. This type of curriculum also opens a window for understanding the material impacts of data-tracking on the community: the cats themselves, their caretakers, and the other people and animals living in near the colonies.

The community engagement project was the most successful in my opinion; it allowed students to learn about data literacy in a way that was not possible with standard classroom assignments and the reason for this success can be understood through a feminist, new materialist lens. In the initial two assignments, students had a relatively short amount of time to accomplish a defined set of tasks. They worked on the first two assignments individually and followed a given set of rules and guidelines. As is expected of them in their roles as students, they wanted to complete the assignments quickly and efficiently. They reflected little on about the role that culture plays in determining categories and classifications in their individual rhetorical analyses and individual database compositions. However, when creating databases for AHHS, a number of differences emerged that contrast with the first two assignments. First, students had more time to immerse themselves in the community engagement project. Not only did it give them more time to think about how categories and classifications have real, material impacts, but they had time and space to develop affective investments in their group database compositions. Students could clearly see how the databases impacted many individuals and animals in the community. In other words, students became enmeshed in

the data structures that they created and directly experienced how their compositions in turn impact the lived experiences of everyone involved in AHHS's TNR program. Students effectively participated in creating material-discursive frameworks that established feral cats as residents of the extended human-animal community.

5.3   Theorizing Community Impacts

In this section, I propose a theoretical explanation of what a database of feral cats accomplishes as a type of communication. My purpose here is to demonstrate a feminist, new materialist analysis of the AHHS database as a type of composition. This analysis involves considering not only the entities represented as data to be tracked, but the invisible cultural and infrastructural attitudes that are suggested by tracking these particular sets of information. In effect, tracking and documenting feral cats validates their worth as living beings, making their existence and health recognizable by government entities such as the City of Lafayette. A data tracking system legitimizes the cats' existence, and the resulting database serves more than a record keeping purpose—it also facilitates the communication of specific values among groups of people. Undocumented feral cats outside of the TNR program, those not under the protection of a "caretaker," those who are not trapped and neutered or spayed, are considered public nuisances. According to the ASPCA, "TNR helps the community by stabilizing the population of the feral colony and, over time, reducing it. At the same time, nuisance behaviors such as spraying, excessive noisemaking and fighting are largely eliminated, and no more kittens are born. Yet, the benefit of natural rodent control is continued" ("Feral Cats FAQ"). These values and goals are communicated through the records kept

in a TNR database. From an animal rights standpoint, TNR programs are usually viewed as preferable to other options, such as euthanizing feral cats. However, groups such as PETA are against TNR because they think that such programs may lead people to abandon their pets, assuming that they would do fine "in the wild," and then escape penalty for mistreating them.

Whether animal rights organizations are for or against TNR programs, historically, humans have fundamentally positioned themselves as having the power and ethical responsibility to caretake or manage what happens to the animals living among us. Scholars have written about the connections between animal rights, ethics, and political theory, all the way from Aristotle to Peter Singer (Linzey & Clarke). Over the past few decades, animal studies has become an increasingly popular area for academic research. In particular, rhetoric scholars have shown interest in the relationship between humans and animals—often gaining inspiration from Jacques Derrida's essay, "The Animal That Therefore I Am (More to Follow)," because it takes up broader questions about thinking, communication, and being—questions about what can be considered as rhetorical and which beings have access to rhetoric.

An encounter with a cat who sees him naked—this serves as Derrida's object of contemplation. He approaches this encounter as a way to problematize the distinctions and relationships between humans and animals, between what may be considered response and reaction, what it means "to be" in a Cartesian sense and what it means "to follow" or to be defined an "other" and against our own definitions, what it means to have access to the symbolic, to be capable or not capable of self-reflection and deception, or covering one's own "traces" or "tracks." Ultimately, one of Derrida's key points

becomes that neither man nor animal can have the "power" to erase its traces—the nature of a sign is that it can only erase itself; this hold true for both humans and animals (136). He asserts that we should take into account differentiated experiences of "a world of life forms" without simply implying that only humans can respond and animals can only react (126). A question arises from this that challenges some foundational assumptions about rhetoric—should we assume that the capacity for rhetoric depends upon symbolic language or upon the ability to reflect upon oneself and deceive others?

Derrida points out that thinkers "from Aristotle to Heidegger, from Descartes to Kant, Levinas, and Lacan" have presupposed that, unlike men, "animals are not of the type *zōon logon echon*," rational, political animals. By focusing on the defining distinction of the divide between human and animal as the ability to rationalize and use language, Derrida argues that men have largely ignored a more important question, one that was asked by Jeremy Bentham: Can animals suffer? (27) Of course, the answer to the question of whether or not animals can suffer can only be "yes"—yet, as we have seen with the TNR program, much of the rationale for instituting public programs to protect animals come back to the benefits that animal lend to humans. Rather than emphasize their capacity for suffering, we focus on how sterilizing cats will prevent them from becoming nuisances to humans and how the program keeps them alive so that they can still control rodents. Not only do humans set themselves apart from animals through the ability to name, classify, and categorize. The categorization of "animals" and "humans" arises out of cultural conditions and emerges with its own connotations; implied within this categorization is that animals are lesser than humans and valued only when they can

be useful to humans. The very act of dividing living beings into "human" or "human animal" versus "animal" largely ignores our commonly shared capacity for suffering.

In her 2010 introduction to *JAC*, Lynn Worsham references the Derrida work in addition to several others by lesser-known writers who go so far as to define this act of categorization as a violence (Wood in Worsham, for example) or who compare the mass killings of animals that humans undertake to the Holocaust, as J.M. Coetzee's character Elizabeth Costello does in *The Lives of Animals*. When humane societies implement programs to protect animals, the individuals working there are probably more aware of the commonalities between humans and animals than most human populations, and they obviously do their jobs out of compassion for animals, yet they still draw on appeals to rationality and utilitarianism when arguing the worth of their programs to a larger civic community. The audience that they appeal to includes government officials, businesspeople, and homeowners who practice conventions that do not value the lives of animals as equal to humans. We can make philosophical and ethical arguments, like Derrida's, ad infinitum, but they may hold little value to a mainstream public audience of people who would not tolerate masses of feral cats roaming around the city.

In this particular situation, one purpose of the TNR database involves making reports to city government, and the database's categories determine what it is capable of communicating. The two main categories, Caretaker and Cat, obviously reflect the greatest distinction we make between types of living beings—the distinction between humans and animals. The data collected about Caretakers involve where they live, how to contact them, when they started and how many traps they have. The data collected about animals involve how to identify them (breed, sex, age, whether ear-tipped), whether or

not they have been spayed or neutered and vaccinated against rabies, and in which zip code they live. For both humans and cats, the point is to keep track of where they are, how to contact them, and to demonstrate how the cats' reproductive capacities have been controlled. In other words, the database communicates to city officials how the cats' lives have been oriented to suit human needs and to reflect our civic or cultural values. It records "facts" about caretakers and cats that are deeply embedded in cultural contexts. These "facts" are recorded as "data."

The above analysis incorporates theoretical readings to an extent that goes beyond what I would expect from a freshman-level writing class, serving as a model of how databases could be reflected upon. I did not expect or want students to write about Derrida. Rather, I hoped that they would reflect on databases as rhetorical compositions that communicate particular cultural beliefs and values. As I comment above, students tend to view databases in terms of their functional of pragmatic aspects. While this dissertation does not include an in-depth study of learning outcomes from this trial run at teaching writing with databases, in order to improve curriculum development, I find it useful to contemplate the feedback in students' reflection papers and also in their course evaluation comments. The following section discusses student evaluations as another source of feedback on what they valued in the curriculum.

5.4   Course Evaluations

In order to further consider what students learned from the database curriculum, I present some of the feedback contained on course evaluations. I expected some resistance to this new database curriculum, but I was shocked when I read some of the negative

feedback that students gave. I was shocked because in class and on their assignment reflections, many students indicated to me informally that they appreciated the practical skills that they learned from building databases. However, many comments on the "what can be improved" section of instructor evaluations contradict this impression. Ultimately, these comments reveal assumptions and expectations that students have about what falls under the scope of "English" and "writing."

I have grouped evaluations into three categories. This first set of responses strike me as fairly general, like comments that I could receive for any course. Students often resist assignments that are open-ended and have them design their own goals—and this resistance is reflected in the last three comments.

- It could move a little faster, it seemed slow a lot of the time.

- There were far too many things going on in this course- i think it should be more honed to a specific set of tasks

- Make the objectives and goals clear from the get go.

- Assignments can be confusing and without a clear end goal; though requirements are clear, it can be difficult to know how to meet the requirements using the technology we have at hand.

The second set of responses listed below are a bit odd. The first comment actually belongs in the positive feedback section. The second indicates the student wasn't listening at all and missed the point—of course, this app was designed for our community partner. It is interesting that one student likes how I teach but the other thinks that I really don't teach anything at all in the course.

- I really like how the course allowed me to grow but also pushed me to write better. I really like how Ms. Jach teaches.

- Actually teach us...Don't make your students build a database for an app that you will profit off of.

The following last and longest set of comments indicate that I should have spent more time emphasizing how everything that we did *was* writing or composing. However, as with teaching any multimodal form of composition, students who are accustomed to only writing alphabetic texts in English classes will experience resistance. I remember mentioning several times that at Purdue, writing or composing is defined broadly and does not merely mean writing with traditional alphabetic texts. Despite my efforts, it is obvious that students still perceive a huge disconnect between "technical work" or "technology" and "writing" or "English."

- Course was instructional in writing skills but could have had more actual writing and less technical work (microsoft access, etc)

- This course does not seem like an English course, but rather a computer or technology course. Making a database seemed totally random and almost like a waste of time, because it didn't relate to what we had did in class prior to the database assignment. My teacher was unaware how to effectively use any of the technology to make a database, which left us figuring out everything on our own. Throwing out the word "rhetoric" every once in a while, doesn't make it an English class. Overall, as an English major, I was very disappointed with what was taught in this class, and

would suggest that an upper-level introduction English class be more focused on improving students reading, writing, and analyzing skills rather than forcing them to do a database.

- Do less with databases and more with in class writing.

- I wouldn't spend so much time doing databases. One project was fair enough but take less time on it. Maybe focus more on writing as a process.

- Clarify the relationship to English concepts more.

- While we definitely did some writing, the impression I'm left with this course is that we didn't do nearly enough and that my writing isn't significantly better than it was at the start of the semester. There were a few tips for writing that I took to heart, but overall my writing isn't much different.

- More writing, perhaps. I'm aware that it is a very vague suggestion, and that it isn't as if we've done no writing whatsoever, but I have classmates in 106 who complain endlessly about how many assignments they get and I can only respond with "sucks for you guys." To be a little more specific, I'd like to spend more time in in the lab writing and doing workshops and less doing technological stuff that, while related to the book and the objective of the class, is not quite English. I'd keep one of the two database assignments (the first, because it's less trouble for everybody), but find something to replace the community project with.

- This course focused really heavily on technology which is great, but I felt like sometimes the writing and the composition part was overshadowed by the focus on things like databases, blogs, etc. I know my writing still needs work, as does many of my classmates. I think we could have used more work with the actual written assignments for the class.

Regardless of what they wrote on evaluations, in actuality, students produced a wide range of alphabetic texts for this class. The writing required for the class included drafts and peer reviews (three drafts, in fact, for the feature article), and I lectured on the writing process as I do in every writing class. The weekly blog posts were required on top of sequenced assignments. We had in-class workshopping days where, as in any writing class, we focused on revision strategies—for example, improving transitions and clarity.

Many reasons could exist for the negative comments, including the timing of the evaluations at the end of the course when we had spent several weeks working on databases in class for the community partners and students had grown tired of the work. Several students point out that working with databases does not seem like an appropriate activity for an English class, despite my repeated attempts to explain to students how multimedia compositions help to develop important literacies. At times during and after the semester, I thought that I had made a mistake in teaching databases to composition students. I wondered if this curriculum would have been more appropriate for a professional writing class. Interestingly, however, this question comes back to my initial argument about data literacy—all students need a foundational understanding of the ways that they participate in data generation through the use of everyday computer applications

and why data structures are not neutral but culturally situated. In the future, I may have students use Ragic, a relational database that automatically programs in relationships, rather than have them spend too much time working out the technical glitches that inevitably arise with joining tables in Microsoft Access. However, I would need to experiment with Ragic more first to make sure that it involves enough of the sort of effort required with Access, where students have to think carefully about how categories relate and connect. Or, so that students also get exposure to coding along with database concepts, I may use an online, open source graph database like neo4j, which requires learning the relatively simplistic Cypher coding language to write, query, and modify the neo4j database. Graph databases are the new standard for social media sites that track relationship pathways through data, and exploring this format could lead students to further think about how their own data is tracked by social media sites.

While the above reflection centers on the context of first-year composition, it has also shaped my thinking about how to build upon a basic understanding of data literacy in professional writing courses. In courses such as business writing, instructors could emphasize strategies for creating professional documents that communicate about data sets, especially those relevant to students' fields of study. While still providing students with opportunities to experiment with database programs and understand how data is rhetorical and cultural, the curriculum could focus on the fact that Big Data is often viewed as an important resource for companies. Projects could involve discussion of rhetorical contexts for Big Data, how to extract data from databases for presentation in business documents, how to create accurate and engaging data visualizations, and lessons

on the ethical concerns that arise when presenting data. The following section provides resources for teaching data literacy in both pedagogical settings.

5.5   Data Literacy for Writing Instructors

The following URL links to a website that I created for teachers who want to learn about data literacy and then potentially incorporate data literacy-related projects, assignments, or lessons into their writing courses: http://christinemasters.net/data_literacy. This site is still in the initial stages of development, and I will build on it over time, possibly also soliciting resources from other teachers who develop data literacy assignments. Because it selects and presents short passages from the context of this dissertation , I omit some of the website's content and instead summarize what the first two sections of the website accomplish. First, the "Introduction" page defines data literacy and explains its relevance in the age of Big Data. Next, the "Why Teach Data Literacy" section explains the rationale for teaching it in both First-year Composition and Professional Writing contexts. Finally, the last two pages provide model assignments and related readings, as inserted below.

5.5.1 Website: Teaching Data Literacy Assignments

The following assignments are appropriate for both First Year Composition courses, but could be modified for Professional Writing courses by assigning reports or presentations instead of reflection essays.

Rhetorical Analysis of a Data Structure

This assignment asks students to practice their essay writing skills as they reflect on the taxonomies and categories involved in data structures as well as rhetorical analysis and visual rhetoric. You will need to create a framework for this assignment by discussing readings on categories and classifications, as well as by providing lessons on the rhetorical situation and visual rhetoric. Download the sample assignment sheet here. You may modify it to suit your needs--no attribution is required.

Database Project

The Database Project asks students to create and write about databases. By understanding databases as types of compositions—ones that record and communicate information about objects and processes occurring in the world—students gain insight into the technical, rhetorical, and cultural foundations of digital applications. In this project sequence, they also gain competencies in creating data visualizations and writing reflective essays, practicing the rhetorical moves involved in each. Download the sample assignment sheet here. You may modify it to suit your needs--no attribution is required.

This project will take about four weeks to complete. It may be taught as an individual or as a group project. It may fit well alongside a range of other assignments, including research papers, editorial essays, discourse community analysis projects, and rhetorical analysis essays. It may also be taught in sequence with other data literacy assignments that explore the cultural implications of categories and classification systems. For example:

- A rhetorical analysis of an existing database or data-driven web application (e.g.,
  a popular website such as IMDB or a database in a library collection).

- Community engagement database project. After completing their own database
  project, students can create one that could be used by a local organization.

By the end of this assignment, students will:

- Demonstrate rhetorical awareness of diverse audiences, situations, and contexts

- Engage multiple digital technologies to compose for different purposes

- Critically think about writing and rhetoric through reading, analysis, and
  reflection

- Provide constructive feedback to others and incorporate feedback into their
  writing

Database Software Options: The following are some options that are relatively easy to

understand and use. It will be easiest if all of your students to use the same database

software that you have already familiarized yourself with, but you could also give them

choices and require them to independently learn different software. The following

applications will work well for this project:

- Ragic - web-based, relational database

- Airtable - web-based, relational database

- neo4j - graph database that works with Cypher query language

- Microsoft Access

5.5.2 Website: Readings

The following texts and videos will help you prepare for teaching data literacy assignments and also can be assigned to students.

Categorization and Classification

- *Sorting Things Out: Classification and Its Consequences* by Susan Leigh Star and Geoffrey Bowker

- *Intertwingled* by Peter Morville – Especially Chapter 2, "Categories"

- "Unstructured Data Really Isn't" by Bradley Fordham, DataScience Central

Data Visualization

- *Data Points: Visualization that means something* by Nathan Yau – Esp. Ch. 1-4, 7

- "False Visualizations: When Journalists Get Dataviz Wrong" by Randy Krum, Huffington Post

- Stephanie Evergreen's "Data Visualization Checklist"

Database Concepts

- "I Dreamed of a Perfect Database" by Paul Ford, New Republic

- "Database Design 1" by CalebTheVideoMaker2 – A down-to-earth explanation of what databases are and how we already use them every day.

- Dr. Daniel Soper's "Introduction to Databases" – Detailed and more academic. Uses business context, but principles apply to all databases.

- *The Manga Guide to Databases* by Takahashi, et al.

- *Beginning Database Design* by Claire Churcher – Especially Chapters 1, 2 and 7

CHAPTER 6. CONCLUSION

Encounters beyond the interface: As I learned from my students' community engagement projects, data literacy assignments are most effective when they provide opportunities for students to encounter more than the computer screen in front of them. Students learn more when they spend time getting to know the people, places, and circumstances that are invested in how the interfaces and their underlying data structures that become created. When a student makes his or her own individual project, she views it as contained and limited. When making a database for an individual assignment, students do not put much thought into the importance of how that data becomes structured. For example, if a student makes a database of her video game collection, she is not thinking about the categories and classifications matter to any audience besides herself. It is an academic exercise and the work involved stays between her, her project, and the instructor who evaluates it. In contrast, when making a database for a community partner, the same student understands that the database will have an audience who cares about how it is structured. The categories and classifications chosen for this database have real, material impact on people and animals. The community database project actually allows students to have encounters beyond the interface that impact their thinking and learning.

In this dissertation, I have articulated a definition of data literacy and argued why it should be incorporated in writing courses. To facilitate the study of data literacy, I have developed a feminist, new materialist methodology that addresses methodological currents in Feminisms and Rhetorics as well as posthuman rhetorical theory. Because Big Data has become an influential cultural phenomenon, I have presented a case for why we need to encourage more critical thought about it, and I have explained why these efforts belong in the context of writing studies. Discussing an initial attempt to teach databases as part of a writing curriculum, I have provided some reflection on how this curriculum could be improved in the future, however, there are still more opportunities for it to be developed and related to other areas of study. Ultimately, the goal of data literacy involves not only providing the conditions for critical thought and reflection on the ways that data structures impact our experiences of the world, but also involves using this knowledge to create new data compositions. As I reflect on future directions for research on data literacy, I also think about the ways that socio-ontological thinking may impact teaching and learning beyond the scope of this project.

First, it may be productive to spend more time thinking about what specific types of rhetorics are involved in data structures. I imagine that coding advocates may scoff at the idea of data literacy as a literacy in its own right, suggesting instead that since databases are made with code, data skills should be considered as a form of computational literacy. However, when we look at the rhetorical strategies involved in making databases, it appears that databases rhetorics are not quite the same as those involved in coding, which follows a procedural rhetoric—lines of code execute computational tasks in a logical sequence. In contrast, data structures involve systems

thinking; they are concerned with codifying the world rather than with executing lines of code. It may be a good idea to revisit Mukherjee's article on how database infrastructures emerged historically to gather insight on the rhetorics emergent within them. More historical and cultural analysis of databases could be done as well, chronicling how relational databases have helped shape information infrastructures in the past, and possibly predicting how emerging database forms, such as graph databases, will have continue to have material force on new media environments. More empirical critique of Manovich's off-the-cuff theories about databases probably would not hurt as well.

Along these lines, we need to consider the material ways that technological entities, such as data structures, intra-act with humans in a range of settings. This involves adopting an intersectional feminist, new materialist mindset that views data structures as active participants in the world. What do data structures demand from us and how does this discursively frame or erase our identities? How did data structures come to exist? To partly answer the first question, I offer: data structures demand that we effectively quantify the world, that we cut up phenomena into discrete chunks to be processed by machines. There are surely implications for the particular forms of storage involved in this process. Those who have worked with relational databases understand how their material constraints require fields to be limited in type and length. One of the reasons graph databases have become popular is that they do not require join tables—tables that match up connections between two separate, main tables—which make data retrieval slow if a database is processing huge amounts of information. Graph databases also label relationships in ways that cannot be done with relational databases. Surely there are additional rhetorical and cultural impacts to be theorized here.

Another feature of data structures, face recognition algorithms are now wide-spread on social media sites such as Facebook. What impact will this type of machine reading have on society and culture? How can we incorporate knowledge of machine learning into data literacy? In other words, how can we develop wide-spread, critical approaches to "the datafication of everything"? Recently, Facebook has begun to collect data on the emotional states of users, as I discuss in Chapter 3. They already have the ability to perform accurate face recognition—how long will it be until they develop an algorithm for emotion recognition? As humanists, how should we address these forms of datafication, both in research and teaching?

Further, if the trend to quantify everything continues, what could it mean for the future of qualitative and mixed methods research? The Big Data quantification trend reflects a specific methodological outlook: if we can gather enough massive amounts of data on a certain area of study, then collectively, this data will accurately mirror reality, thus providing insights on human behavior. These simplistic assumptions perpetuate the Big Data mindset uncritically, re-inscribing the kind of positivism that new materialism seeks to avoid. Critical Data Studies address these issues. Additionally, as Linnet Taylor proposes, we need to bring more social awareness into the critical study of data. Feminist new materialist theory would add to the conversation in productive ways, and this could be another focus of future research.

It is important to remember what the "feminist" in feminist new materialisms stands for. As I briefly mention in a previous chapter, the goal of feminist, new materialist theory has little to do with advocating for any essentialist understanding of what it means to be female. However, the term feminist new materialism indicates a specific theoretical

approach that seeks ethical disclosures of situations in a way that is entirely compatible with intersectional feminism. While participants in a situation ontologically exist as a result of their intra-actions, the way we frame situations discursively has material impacts. Further, feminist methodologies emphasize how important power relations often are invisible until we ask questions about them.

To continue this work in the context of data literacy, we should continue to ask how feminist new materialisms can help shape not only the critique but also the productionof data structures. For example, data structures systematically exclude or ostracize certain groups of people because they fail to include categories that everyone can identify with. Just as building infrastructures usually only give people two choices when using public bathrooms, sectioning off ones for men and ones for women, the same thing can happen in data structures when people are forced to identify as one gender or the other—for instance, when filling out forms or when choosing an avatar in a video game. We need to address how data structures can open up spaces that will recognize multiple, intersectional identities rather than close them down and replicate more of the same structures of privilege. Ultimately, we need to continue questioning who benefits from data collection practices and who may be exploited as a result of it. Big Datasets are held at a premium by corporations, who want to use them to market their products. Because it has become a such valuable commodity, we might ask, to what extent should data be regulated? Scholars like Annette Markham research these questions, focusing on internet ethics. Issues in data literacy could intersects and add to these conversations.

More pedagogical opportunities can also be developed from the ideas presented in this dissertation. At least a couple of areas could be expanded upon. One involves

applying more socio-ontological thinking strategies to course activities and assignments. For example, we could teach contemplative mapping techniques to undergraduates as a way for them to think about what happens beyond interfaces when they use interfaces. For that matter, contemplative mapping could be used as an invention strategy for writing papers, where students could map out what they know about a topic and then contemplate the white space around it as representative of what they don't know as a way to provoke open-ended thinking and research.

Another area for expansion has to do with teaching more about how databases and coding work together. For example, students could use social media website APIs (application program interfaces) to do their own data mining and then use this data set as an object of rhetorical and categorical analysis, or the data mining could be geared towards research questions having to do with race, gender, culture, and technology. In the context of business writing courses, students could use API data sets as the basis for creating reports, data visualizations, or presentations. Of course, the coding and API idea would require instructors (including me) to learn these skills themselves. I also would be interested in continuing helping instructors gain competencies in these sorts of skills, as I intend to do with my website, "Data Literacy for Writing Instructors."

This project also could extend on an empirical level through research studies that would test the impact of data literacy curricula on students. This testing could involve measuring learning outcomes and / or measuring change in technological self-efficacies, comparing the results based on gender. My initial plan for the dissertation was to include this type of testing, but I ended up going in a more theoretical direction. This mixed methods study would measure how students' technological self-efficacies (how well they

perceive that they can perform) change after completing model assignments and it also would assess writing teachers' experiences as they incorporate these assignments into their syllabi. The proposed research questions could include:

- How does teaching database design in the context of writing instruction increase students' technological self-efficacies? Are there differing results between genders?

- How does the database assignment improve students' data literacy and improve the effectiveness of a first-year writing curriculum?

Students who complete model database assignments would be given anonymous self-efficacy surveys. As a control group, students in a similar number of traditional writing classrooms would also be surveyed. In both cases, surveys could incorporate a self-efficacy scale, which would measure how individuals evaluate their own orientations and proficiencies toward technology. While such an instrument is not explicitly feminist, it still would fit well with feminist methodology: self-efficacy helps women to overcome cultural messages and invisible power dynamics that place men as the more tech-savvy gender. Accordingly, students also would be asked anonymously to self-identify in terms of gender, race, and sexual orientation. In addition, I would gather feedback on the perceived effectiveness of model assignments by interviewing and/or conducting focus groups with teachers and by examining their course syllabi and assignment sheets.

Taken together, there are many avenues for continuing research on data literacies. These include empirical studies, first-year composition and professional writing curriculum development, and further engagement in new media theory, Computers and Writing, and in Critical Data Studies.

In closing, I leave you with a story.

When I was nineteen and attending community college, I took an auto maintenance course. I changed my own oil, transmission fluid, and spark plugs. I used strange-looking wrenches. I put oil in the engine when the level showed low on the dipstick. I replaced my Mazda GLC's broken tail light with an intact one that I found at a junk yard. At the time, I reflected little on why it was important for me as a young woman to be able to do these things for myself—it just felt good to do them. Yet, looking back, the fact that I was able to do these "mechanical" tasks (usually something that men did) helped me to develop a healthy sense of my own technological self-efficacy, which likely carried through to my willingness to experiment with technologies in workplace and academic settings. Moving forward, I see my data literacy research as ultimately helping young women to increase their own technological self-efficacies so that they will feel confident in taking on technologically-based work.

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APPENDIX

APPENDIX

      The following appendix contains the syllabus and assignment sheets used in the English 108 course that I discuss in Chapter 5.

English 108: Accelerated Composition with Community Engagement

Instructor: Christine Masters Jach
Email: cjach@purdue.edu
Office hours: Thursdays 2-3 p.m., HEAV 127
Website: Blackboard Learn

Course: Spring 2015, 10800-004; CRN 13509
Meets: Tuesdays (Wetherill 212) 3:00-4:15
Thursdays (Heavilon 102) 3:00-4:15

Overview

English 10800 is a 3 credit accelerated introductory composition in which students will engage in public writing and community service. The purpose of integrating a community engagement component into this introductory course is three-fold: (1) to increase students' awareness of the rhetorical strategies integral for the composition of effective written, visual, and multimedia texts, (2) to develop students' understanding of what community engagement is and how it relates both to education more generally and one's own life more specifically, and (3) To introduce students to the larger, local community in which they live, beyond Purdue's campus borders. This course emphasizes a rigorous approach with high expectations on students' abilities to work quickly and independently.

The overarching theme for this section of English 108 is "Cultures, Communities, and Technologies." In particular, we will focus on the technologies involved in data organization. You may have heard the catch phrase "big data" lately in news stories—writers often mention that we now have access to more collections of raw data than ever before in history. This is true, and employers in scientific, engineering, business, and humanities fields increasingly look to hire individuals who understand how to work with data. To help address these needs, this course advocates that all college students should learn " information literacies" alongside textual literacies.

In your future classes and careers, you will likely be expected to engage with some sort of data structure—for example, you may need to work with databases that contain empirical test results, or statistics on customer purchasing habits, or digitized archives of historical documents. It will benefit you to understand these structures rhetorically as types of techno-cultural compositions. That is, they are not mere collections of random information, but repositories of data assembled and shaped by a myriad of influences. By interrogating how data are organized, we also realize how cultural classifications and standards shape them within their local and global contexts. Through our community engagement projects, we experience how local organizations define data and how data organization functions as a type of writing—as a way to organize, make sense of, and record everyday experiences.

To improve your informational literacies alongside your textual literacies, this course leads you through a series of assignments that combine traditional writing with multimedia composition. We also bridge traditional writing instruction with community engagement projects by taking what we learn in the classroom and applying it to data organization projects for two local organizations.

Goals

Most students who enroll in English 108 already have a strong foundation in writing academic papers, organizing written ideas, and conveying arguments in specific contexts. This course hones these writing skills while also providing a foundation in rhetoric, multimedia composition, and the principles of service learning. Students move beyond thesis statements and outlining techniques, focusing instead on writing as a means of thinking, as a way to critically process readings and ideas, as a method to communicate complex arguments through multimedia, and as a way to interact with the larger, local community. By the end of the semester, students will have a strong sense of their own writing style and experience greater confidence and ease at communicating ideas in a range of media. They will have improved their critical reading abilities, their informational literacies, their rhetorical awareness, and possess greater knowledge of their local communities.

As students become more competent in composing with multimedia, they also will learn to interrogate technologies through a cultural lens. Students will read texts that question the roles that media play in every day life, considering how technology is culturally shaped and how culture manifests through technology. Finally, students will learn about the environment outside of campus as they participate in community engagement projects, which also give them first-hand experience of how technology and culture permeate local contexts.

Texts Required

- *Cross Currents: Cultures, Communities, Technologies*, 1st Edition. Authors: Blair, Murphy, and Almjeld. ISBN 9781413014747.
- Anderson, M.T. *Feed*. ISBN 9780763662622.
- *Composing Yourself: A Student Guide to Introductory Composition at Purdue, 2014-2015*. Authors: Blackmon, Haynes, & Pinkert. ISBN: 9781598718584 (available at bookstores around campus). **This book contains all other course policies not included in this syllabus document.**
- Additional PDF readings, available on the course website.

Technological Competencies

Familiarity with certain technologies is crucial for participation and success in the course. Please ask for assistance if you need it at any time. You are responsible for the following tasks:
- Embrace Blackboard Learn, even if you've never used it before. Explore its many tools and ask questions when you feel unsure about where to find or submit something.
- Set up your @purdue.edu email so that you can access it regularly and reliably.
- Become proficient using email attachments, resolving file compatibility issues, and following email decorum.
- Maintain back-up copies of all assignments via your home directory, USB drives, or with cloud storage such as Dropbox.

Major Assignments and Components

Digital Journal

This assignment spans the entire semester and is worth a large portion of your grade for the course. The purpose of the digital journal is to give you an opportunity to process and reflect on the readings, develop your critical reading abilities, to provide a low-stakes environment to experiment with your writing, and to give you a space in which to develop your writing style. Additionally, you will become comfortable with writing online as you learn the technical features of blogging platforms. At the end of the semester, you will expand one of your journal entries into a fully developed and researched feature article intended for public consumption. The feature article will be graded.

Website Analysis

In this assignment, you will practice your essay writing skills as you reflect on the principles learned during the first few weeks of class, specifically, rhetorical analysis and categorical analysis. Because it requires a design plan as well as substantial revision between drafts, this assignment emphasizes learning the importance of planning and revision in the writing process.

Database Project

This project asks you to design and create a small database around a subject of your choosing, using instructions and software provided in class. Then, you will write a multimedia essay that accomplishes two things: 1) reflects on the process of creating a database from scratch, and 2) showcases a selection of data visualizations that you will create based on your data.

Community Partner Data Organization Project

During the second half of the semester, we will work with two different community partners: Almost Home Humane Society and Celery Bog Nature Area. Students will split up into groups and complete data organization projects for these partners. Each group will be responsible for defining its own plan and deliverables, with guidance from the course instructor. Finally, students will individually complete team evaluations and semester reflections as a substitute for a final exam.

Grading

Digital Journal (360 points)

Journal Posts 1 – 12 (12 weeks x 20 points)	240
Feature article draft	20
Feature article final	100

Website Analysis (140 points)

Design plan	20
Essay draft	20
Essay final	100

Database Project (200 points)

Design plan with conceptual map	20
Database	80
Multimedia essay	100

Community Partner Data Organization Project (300 points)

Design plan – scored as group	20
Project deliverables, defined by each team – scored as group	180
Team evaluation & semester reflection – scored individually	100
Total	1000

Grades follow the standard plus-minus letter-grade scale with corresponding percentages.

Percentage	0%	60%	63%	67%	70%	73%	77%	80%	83%	87%	90%	93%	97%
Letter Grade	F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Total Semester Points	0-599	600-629	630-669	670-699	700-729	730-769	770-799	800-829	830-869	870-899	900-929	930-969	970-1000

Attendance

This class requires you to participate in discussions and hands-on composition activities. For the course to be a success, everyone's participation is necessary. For that reason, attendance is required. You will be allowed three absences—no questions asked; after three unexcused absences, I will take 10% off of the total points possible for the course. After five unexcused absences, another 10% will be deducted from your total points possible. On the days that we do peer reviews, you are required to bring a rough draft of your paper. If you do not have a rough draft, you cannot participate effectively in class that day, and therefore you will be considered absent. **Arriving more than 10 minutes late counts as an absence**. If you have a legitimate reason for missing class—severe illness, Purdue event, etc., you will be excused only if you provide a written doctor's note or a letter from your activity program coordinator.

Late Work

The majority of missed class assignments cannot be made up. If a serious problem arises, however, contact me in writing prior to the deadline to determine whether or not an extension may be granted.

Academic Integrity

Purdue students and their instructors are expected to adhere to guidelines set forth by the Dean of Students: http://www.purdue.edu/odos/osrr/academicintegritybrochure.php. Excerpt: "Purdue University values intellectual integrity and the highest standards of academic conduct. To be prepared to meet societal needs as leaders and role models, students must be educated in an ethical learning environment that promotes a high standard of honor in scholastic work. Academic dishonesty undermines institutional integrity and threatens the academic fabric of Purdue University. Dishonesty is not an acceptable avenue to success. It diminishes the quality of a Purdue education, which is valued because of Purdue's high academic standards."

Students with Disabilities

If you have a disability that requires academic accommodation, please let me know within the first three weeks of the semester in order to discuss any necessary adjustments.

In Case of a Campus Emergency

In the event of a major campus emergency, course requirements, deadlines and grades are subject to changes that may be necessitated by a revised semester calendar or other circumstances. You can acquire updated information from the course website, by emailing me, or by contacting me through the English Department at (765) 494-3740.

Classroom Environment

I strive to provide a respectful and supportive environment in our classroom, and I ask that you do the same. All class-related interactions will be conducted in accordance with Purdue's nondiscrimination policy: "*Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability, or status as a veteran.*" Violent or inappropriate behavior will not be tolerated in any form—including speech and writing—and it may result in immediate removal from the course and disciplinary action.

Schedule Summary

Please complete readings and journal entries **BEFORE THE THURSDAY** of each week. Check the course website on a weekly basis because this schedule is subject to change. Assignment sheets are provided on the course website.

Wk	Dates	Readings	Digital Journal (see assignment sheet)	In-class Activities and Project Due Dates
1	1/13 1/15	Read the "Categories-Morville" PDF (emailed on Monday, 1/12, and available on the course site). Skim over *Composing Yourself.*	Complete digital journal setup and write post #1 (see instructions on assignment sheet). This is due by the end of the day on Friday. Put your DJ's URL link on the course website.	Introductions and syllabus Discuss readings and ICAP policies **Digital Journal** assignment sheet **Website Analysis** assignment sheet
2	1/20 1/22	*Crosscurrents*: Chapter 1 – Introduction *and* Chapter 2 – Information Literacies	Post #2 (carefully follow instructions on the D.J. assignment sheet)	Computer work on Tuesday Lecture / reading discussion on Thursday **Design Plan draft due 1/22**
3	1/27 1/29	*Crosscurrents*: Chapter 3 – Shared Memories, Shared Identities	Post #3	Computer work on Tuesday Lecture / reading discussion on Thursday **Design Plan final due 1/29**
4	2/3 2/5	*Crosscurrents*: Chapter 4 – Gendered Viewpoints	Post #4	**Essay draft due 2/3 – Peer Review in class** Lecture / reading discussion on Thursday
5	2/10 2/12	*Crosscurrents*: Chapter 5 – Gaming Worlds	Post #5	Computer work on Tuesday Lecture / reading discussion on Thursday **Essay final due 2/12** Receive **Database Project** assignment sheet
6	2/17 2/19	PDF reading (on website): Database design	Post #6	Computer work on Tuesday Lecture / reading discussion on Thursday **Design Plan with conceptual map due 2/19**
7	2/24 2/26	PDF reading (on website): Database design	Post #7	Database work in computer lab all week Extra lab day on Thursday – location TBA
8	3/3 3/5	PDF reading (on website): Data visualization	Post #8	Receive **Community Project** assignment sheet Community partner orientation
9	3/10 3/12	*Feed* by M.T. Anderson, p. 1-150	No journal post this week, but you are welcome to start Post #9 early.	**Database and Multimedia essay due 3/10**
	3/17-19	*SPRING BREAK*	*No journal post this week*	*No class*
10	3/24 3/26	*Feed* by M.T. Anderson, p. 151-300	Post #9. Write one response to Week 9 and 10 readings (the whole book).	Group / computer work on Tuesday Lecture / reading discussion on Thursday **Team design plans due this week**
11	3/30 4/2	*Crosscurrents*: Chapter 6 – Community Engagement & Relations	Post #10	Group / computer work on Tuesday Lecture / reading discussion on Thursday
12	4/7 4/9	*Crosscurrents*: Chapter 7 – Social Networks	Post #11	Group / computer work on Tuesday Lecture / reading discussion on Thursday
13	4/14 4/16	*Crosscurrents*: Chapter 8 – Human Ecologies	Post #12	Group / computer work on Tuesday Lecture / reading discussion on Thursday
14	4/21 4/23	PDF reading (course website): Presentation strategies	No journal post due this week. **Feature article draft due on 4/23.**	**Community project deliverables due** Project presentations during class times
15	4/28 4/30	*DEAD WEEK – No new readings*	Work on feature article revisions and/or start working on team assessment and semester reflection. *These assignments are due during finals week as a <u>substitute for a final exam</u>.*	Final assignments will be workshopped in class this week. We also will address any unmet needs of community partners.
16	5/4-5/8 Finals	No class meetings – turn in final assignments on Blackboard	**Feature article final** due by Tuesday, 5/5, 11:59 PM.	**Team Assessment and Semester Reflection** due by Tuesday, 5/5, 11:59 PM.

Website Analysis Assignment Sheet

Purpose

In this assignment, you will practice your essay writing skills as you reflect on the principles learned during the first few weeks of class, specifically, rhetorical analysis and categorical analysis. Because it requires a design plan as well as substantial revision between drafts, this assignment helps you to learn the importance of planning and global revisions in the writing process.

Audience

The audience for this essay is your course instructor and your classmates.

Instructions

Choose a data-driven interactive website as the subject of your analysis. Write a short essay (around 1000 words) in which you analyze both the website's rhetorical strategies and its categorical structures. To write a solid analysis, you should refer to class lectures on rhetoric as well as Morville's "Categories" chapter (see the PDF distributed during the first week of class). Here are some prompts to get you thinking about what to include in your essay.

- Determine the context, audience, and purpose of the website.
- What kind of taxonomy is at work on the site? In other words, what are the main categories presented? You may find clues to the taxonomy in the menus, buttons, hyperlinks, text submission boxes, etc.
- How do cultural factors influence the taxonomic categories?
- What are some categories that the website **excludes**? Why do you think that is?
- How would the website be different if it included different categories or had a different taxonomy?
- If the target audience were different, how would the categories be different?
- What sort of visual rhetoric do you observe on the site? Is it effective? Ineffective? Why?

If you thoroughly reflect on these questions as you write, you may find that your first draft has more than 1000 words. That's okay. Part of the revision process involves rearranging ideas and cutting out redundancies between drafts. In well-written essays, final drafts are often substantially different from first drafts. Strive to create a tightly written final draft, where you choose every word and sentence carefully, insuring that each has purpose and meaning within the overall essay.

Writing Process

You will write a design plan, a rough draft, and a final draft for this essay. The rough draft will be peer reviewed and instructor reviewed. Both the design plan and the rough draft will be graded on a credit/no-credit basis. You will have time to make revisions before the final draft is due, and this will receive a letter grade.

Grading Rubric

Our entire class will work together to create a grading rubric for this assignment. The purpose of this group rubric activity is to help you reflect on, evaluate, and internalize what goes into an effective piece of writing that's appropriate for college-level courses.

Due Dates

Design plan draft: 1/22
Design plan final: 1/29
Essay draft: 2/3
Essay final: 2/12

Database Project Assignment Sheet

Purpose

This project asks you to create and write about databases as a method for building your informational literacies. By understanding databases as types of compositions—ones that attempt to record and communicate information about objects and processes occurring in the world—you will gain insight into the technical, rhetorical, and cultural foundations of digital applications. You will also gain competencies in creating data visualizations and writing reflective essays, practicing the rhetorical moves involved in both.

Audience

The primary audience members for this project are your course instructor and your classmates. However, in addition, you may define your own wider audience—for example, a specific community that shares interest in your database topic.

Requirements

A. Design plan (for database) with conceptual map

Follow the instructions on the "Design Plan Directions" document. You are designing the database part of the project here, not the essay part. Your statement of purpose (item #1) should contain as much specificity as possible about what you intend to track in your database. Speculate on how the information could be used. Insert your conceptual map as the arrangement (item #4). The conceptual map should use the E-R (entity-relation) model as described in *The Manga Guide to Databases*.

Points possible: 20. Full 20 points awarded only for above average work (includes specifics and details).

B. Database

Use Microsoft Access (on ITAP computers) or OpenOffice Base (free download to your own computer) to create a relational database around the subject of your choosing. We will brainstorm ideas in class. Regardless of what you choose to catalog, your final database should contain a minimum of three linked tables, a minimum of 20 primary records, at least one data entry form, and at least three queries. You will need to have done the assigned readings to know what this means.

Points possible: 80. Graded as pass/fail. Awarded full 80 points if meets the minimum criteria listed above.

C. Reflective essay with data visualizations

Write a reflective essay about the process of creating your database. You can structure the essay chronologically or topically, but be sure to address all of the choices that you made as you put the database together. Discuss your tables, records, and fields extensively in terms of their relational meanings and larger cultural contexts. Address any surprises or insights that came up. Include at lease three visualizations created from your database queries. Explain how you created them and how they illustrate the data that you collected.

Your final essay should have a controlling idea, provide details and examples from your work, be well organized with coherent paragraph transitions, and follow MLA style guidelines. For data visualization ideas and inspiration, refer to our Week 8 reading by Nathan Yau. Insert images into your essay as figures alongside the text or in an appendix; explain them in the text of the essay.

Points possible: 100. The reflective essay rubric will be similar to the web analysis essay rubric, except instead of rhetorical analysis, you are doing reflection on what you experienced and learned in the process of building a database. We will discuss a rubric close to the due date.
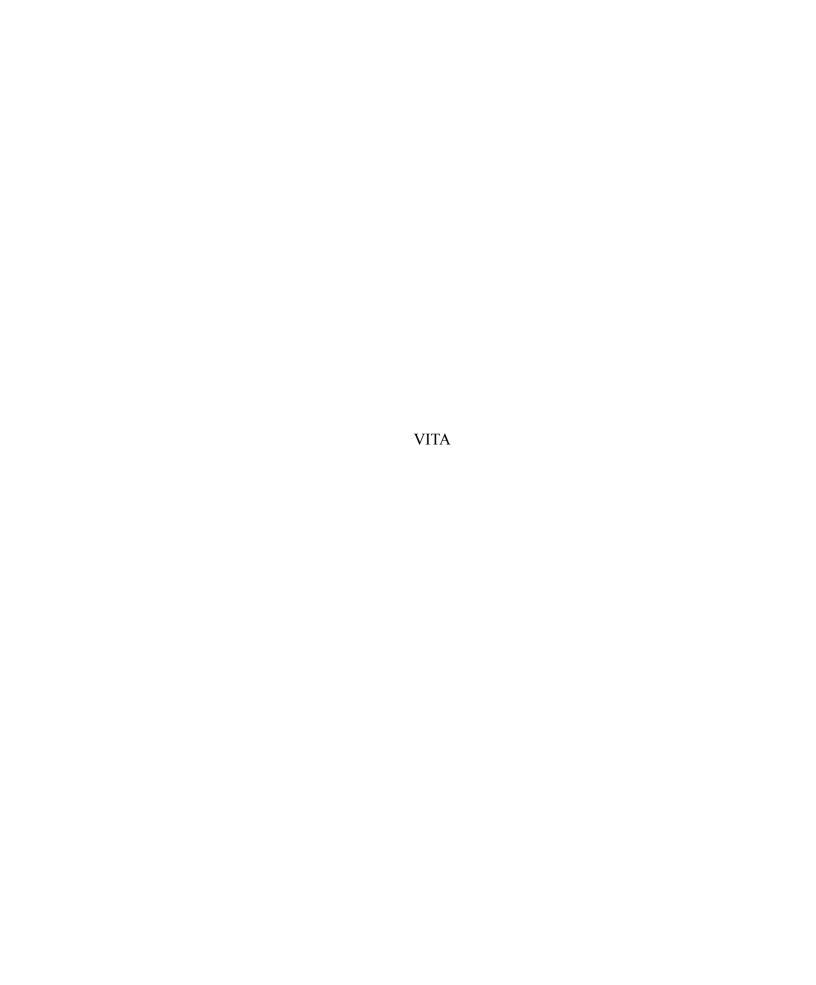
Writing Process

Since considerable time will be spent workshopping this project during class time, and you will receive feedback from classmates and instructor each day of class, this project won't have a formal peer-review day or draft assignments. Therefore, it is extremely important that you attend class every day and seek instructor input outside of class if you get confused or off-track. Email cjach@purdue.edu with questions.

English 108 - Christine Masters Jach   **Spring 2015**

Databases in the Community: Group Project Assignment Sheet

Working in groups of four, design a database for your community partner. More than one group will be assigned to the same partner, and these groups will compete to see who can make the most usable, efficient, and innovative database. The Celery Bog Nature Area, owned by the City of West Lafayette, needs a database to track nature pictures and information related to park locations. The Almost Home Humane Society needs a database to track information about feral cat colonies for their TNR (Trap, Neuter, Release) program and report it to the City of Lafayette. Representatives from each partner will explain their needs during our site visits.

To write a design plan for a database, you will need to ask your community partner questions. Additional visits or interviews may be necessary. To coordinate this information-gathering activity, pick one group member to serve as your group's "communication liaison" with the community partner and with other groups in the class who may be looking for similar information. Whenever you email, call, or visit your community partner, be sure to cc: or inform your instructor (cjach@purdue.edu).

COMPONENT	DUE DATE	POINTS (300 total)
Design Plan for Group Project Compose a document that addresses: 1. <u>Statement of purpose.</u> Why are you making the database? Who will use it? What is the end goal? What will you accomplish by April 23? 2. <u>Strategies.</u> What categories are important to include? How do you know? 3. <u>Choice of application.</u> Will you use Microsoft Access? Or a different open source DB application? Where will it be stored? How will the users have access? Explain your choices. 4. <u>Arrangement.</u> Describe the categories and structure of information that will be tracked. Explain the importance of each category or structure. 5. <u>Production.</u> To accomplish the statement of purpose, what tasks need to happen, and when? Who will do each task? 6. <u>Testing.</u> Specifically explain how you will test the DB to make sure it is usable.	**Thursday, March 26**	**20 points**
Weekly Progress Reports Submit a progress report each week according to the instructions on Blackboard.	**Fridays** 4/3, 4/10, 4/17	**60 points** (20/week)
Deliverables Project deliverables include the finished database and any supplemental materials or accompanying instructions that your group deems necessary. These are graded according to how well they meet the needs of the community partner and fulfill the design plan.	**Thursday, April 23** Make any needed adjustments before finals week.	**100 points**
Presentation Give a ten-minute presentation (include visuals) that explains what your group accomplished. Refer to the presentation strategies discussed in the Week 14 readings on our course website. Community partners and guest judges will attend presentations and vote on best project awards.	**Thursday, April 23** Finish before class to present during class	**20 points** plus potential "awards"
Team Assessment and Semester Reflection See instructions on Blackboard. Each student submits independently. Along with the digital journal feature article final draft, this assessment/reflection paper serves as a replacement for a final exam.	**Tuesday, May 5** (FINALS WEEK, instead of a final exam)	**100 points** (scored individually)

VITA

VITA

Christine L. Masters

<masterscl@purdue.edu> • <http://christinemasters.net>

Education

- Ph.D., English, Purdue University, West Lafayette, Indiana, August 2016 Primary Area: Rhetoric and Composition; Secondary Areas: Professional and Technical Writing, Rhetoric, Technology, and Digital Writing. Dissertation: Encounters Beyond the Interface: Data Structures, Material Feminisms, and Composition. Committee: Jennifer Bay (Chair), Patricia Sullivan, Samantha Blackmon, Thomas Rickert

- M.A., English, Western Illinois University, Macomb, Illinois, May 2011 Certificate: Literary Studies. Thesis: Global Imagination and Visual Rhetoric in Google Earth. Committee: David Banash (Chair), C. Bradley Dilger, Shazia Rahman, Andrea Spain B.A., German Language and Literature, University of Washington, Seattle, June 1994

Scholarship

Scholarships, Grants, Awards, and Prizes

- Purdue Research Foundation Grant ($20,000), Year Long Fellowship, Purdue University, 2015-2016. Competitive grant awarded for dissertation scholarship.

- Professional Writing Showcase Award, Best Instructor Presentation ($100), Purdue, 2015. For presentation, "Technology X Backgrounder Reports in Business Writing."

- Crouse Scholarship: Internship in Academic Publishing ($2,500), Purdue, 2014-2015. Funded editorial assistant position for Peitho journal through the academic year.

- Crouse Scholarship: Internship in Academic Publishing ($5,000), Purdue, 2013-2014. Funded editorial assistant position for Peitho journal through the academic year.

- John Quincy Adams Award for Excellence in the History of Rhetoric, Purdue, 2013. With Stacy Nall for project on Women's Rhetoric in Early English Books Online (EEBO).

- Alfred J. Lindsey Memorial Scholarship ($1,000), Western Illinois University, 2010-2011.

- William Ray Scholarship ($500), Western Illinois University, 2011.

- Sebastian Melmoth Prize for Best Grad Student Paper ($100), EGO Conference, Western Illinois University, 2010.

Publications

- "Women's Ways of Structuring Data." Ada: A Journal of Gender, New Media, and Technology, Vol. 8, November 2015 (3,200 words) <http://adanewmedia.org/>

- Review of Cutting Across Media: Appropriation Art, Interventionist Collage, and Copyright Law, eds. Kembrew McLeod and Rudolf Kuenzli. American Book Review 32.6, 2011: 11-12.

- "Digital Legacies: Women in Early English Books Online (EEBO), 1486-1660." With Stacy Nall. Status: Revise and Resubmit.

- "Classical Style and Data Visualization." Article geared towards professional writing or new media journals. In progress.

- "Zooming the Digital Sublime: Google Earth's Intimate Landscapes." Multimedia Essay. In progress.

Conference Presentations

- "A Grad Student's Perspective on Mentoring." Journal Editing as Mentoring Panel. Feminisms and Rhetorics. Arizona State University, 30 October 2015.

- "Digital Legacies: Feminist Methodologies in the Online Archive," Feminisms and Rhetorics, Stanford University, Palo Alto, California. 28 September 2013.

- "Feminist Infrastructures," Association of Teachers of Technical Writing (ATTW) Conference. Indianapolis, Indiana. 19 March 2014.

- "Digital Poster: Teaching Composition with Databases." Digital Pedagogy Poster Session. Conference on College Composition and Communication (CCCC), Tampa, Florida. 20 March 2015.

- "Material Methods: Databases and Composition," Conference on College Composition and Communication (CCCC), Indianapolis, Indiana. 21 March 2014.

- "(Kitchen?) Cabinet of Wonders: Pinterest as Everyday Writing," Conference on College Composition and Communication (CCCC), Las Vegas, Nevada. 15 March 2013.

- "Gateways of Perception: Zooming Visual Rhetoric and Composition," Conference on College Composition and Communication (CCCC), Saint Louis, Missouri. 23 March 2012.

- "Contested Space, Clashing Worldviews: Google Earth's Environmental Rhetorics," Conference on College Composition and Communication (CCCC), Atlanta, Georgia. 7 April 2011.

- "The Spaciousness of Visual Rhetoric: Classical Style and Data Visualization." Research Network Forum. Tampa, Florida. 18 March 2015.

- "My Ongoing Celery Bog Project: Collaborative App Writing and Community Engagement," T.R. Watson Conference. Louisville, Kentucky. 16 October 2014.

- "Collaborative App Writing and Community Engagement," Computers & Writing. Pullman, Washington. 7 June 2014.

- "The Spaciousness of Digital Rhetoric," University of Michigan Graduate Student Conference on Language and Rhetoric, Ann Arbor, Michigan. 15 November 2013.

- "Zooming in Google Earth: Truth and Thought in Virtual Navigable Space," Philosophy and Literature Conference, Purdue University. 19 October 2012.

- "Visualizing Climate Change in Google Earth," Association for the Study of Literature and Environment (ASLE) Conference, Bloomington, Indiana. 23 June 2011.

- "Movements of Imagination: Digital Maps and Bachelard's 'Intimate Immensity,'" Western Illinois University English Graduate Organization Conference, Macomb, Illinois. 23 October 2010.

- "Environment and Class in Leslie Marmon Silko's Ceremony," Western Illinois University English Graduate Organization Conference, Macomb, Illinois. 14 November 2009.

Invited Talks

- "Poetics and Politics in Google Earth," Western Illinois University Library Speaker Series, Macomb, Illinois. 25 January 2011.

Academic Journal Editing and Production

- Editorial Intern and Peer Reviewer, Peitho, the Journal of the Coalition of Women Scholars in the History of Rhetoric and Composition (CWSHRC). Purdue University, 2013-2015. <http://peitho.cwshrc.org/>

Professional Memberships

- The Fembot Collective <http://fembotcollective.org/>

- Coalition of Women Scholars in the History of Rhetoric and Composition (CWSHRC) NCTE / College Composition and Communication (CCC)

- Rhetoric Society of America (RSA)

- Association of Teachers of Technical Writing (ATTW) Association for Business Communication (ABC) Modern Language Association (MLA)

Teaching

Courses Taught

- Approaches to Teaching College English: English 505. Purdue University,

  Department of English: Fall 2015, Spring 2016 (two sections). This course introduces

  new ICaP (Introductory Composition at Purdue) graduate teaching assistants to a

  range of professional literature on the teaching of writing. Topics covered include

  methodologies, issues of assessment, and the relationship between theory and

  pedagogy. Guide new TAs in developing syllabi, designing assignments, and creating

  effective lesson plans. This teaching assignment also involves observing mentees'

  classes twice per semester, ensuring that program goals are met, and providing

  constructive feedback on teaching strategies.

- Business Writing Online: English 420Y. Purdue University, Department of English:

  Summer 2013, Spring 2014, Fall 2014 (four sections). Distance-learning course

  taught via Blackboard Learn, focusing on the rhetoric of professional communication.

  Assignments include memos, letters, emails, job application documents,

  backgrounder white papers, and recommendation reports. Students engaged in blogs

  and discussion forums and collaborated successfully on remote team projects.

- Business Writing: English 420. Purdue University, Department of English: Fall 2013,

  Fall 2014 (three sections). Assignments included memos, emails, resumes and cover

  letters, elevator speeches, backgrounder white papers, proposals, recommendation

  reports, project reports, and writing for specific components of project production.

  During Fall 2013, I took a client-based experiential learning approach in this course.

Working in teams, students research and produce a mobile phone application for the City of West Lafayette's Celery Bog Nature Area.

- Accelerated Composition with Community Engagement: English 108. Purdue University, Department of English: Fall 2012, Fall 2014, Spring 2015 (three sections). The assignment sequence for this experiential learning and community engagement course varies depending on the community partner. Focus has ranged from environmental awareness, to individual volunteering, to database creation for specific community organizations. Community partners have included the Almost Home Humane Society of Lafayette and the Celery Bog Nature Area / West Lafayette Parks and Recreation.

- Introductory Composition: English 106. Purdue University, Department of English: Fall 2011 – Spring 2013 (four sections). Using a syllabus approach called "UR@," I encouraged students to write in a variety of genres that highlight situatedness, new media, design, and culture, with an emphasis on learning through doing, play, and experimentation. Assignments included essays, research papers, editorials, annotated bibliographies, documentary videos, online journals, and digital collections.

- College Writing I: English 180. Western Illinois University, Department of English, Fall 2010 – Spring 2011 (four sections). This course encouraged students to develop personal writing into academic genres through a scaffolded sequence of narratives, opinion and research papers, and timed essay exams.

Writing Centers, Tutoring

- Graduate Assistant Writing Tutor, Western Illinois University, Macomb, Illinois, 2009-2010. Volunteer ESL Tutor, University of Washington, Seattle, Washington, 1993-1994.

- Paraprofessional Peer Tutor, Career Planning and Placement Center, Western Washington University, Bellingham, Washington, 1990-1991.

- ESL Tutor, Whatcom Literacy Council, Bellingham, Washington, 1991.

Continuing Education Workshops Developed

- "Data Literacy in the Writing Classroom." Online Course for Teachers. Forthcoming, 2016.

- "Making Social Media Work for You," with Kathryn Yankura. Area IV Agency, Lafayette, IN, May 2013.

Community Engagement Projects

- Developer for Mobile App, "Wildflowers of the Celery Bog," City of West Lafayette Parks and Recreation, 2015. Forthcoming on iOS and Android, December 2015.

- Project Manager for the TNR Feral Cat Database Project with my accelerated writing class, Almost Home Humane Society, Lafayette, Indiana, 2015.

- Project Manager for "Explore Celery Bog," iOS App, with my business writing and accelerated composition classes, for City of West Lafayette Parks and Recreation, 2012-2013. <http://web.ics.purdue.edu/~cjach/CeleryBog/>

- Content Developer for Video, "Mayor Roswarski on Sanitation & Recycling in 2013," City of Lafayette, with Public Rhetorics graduate student classmates, 2013 < https://youtu.be/sZKQF3SB6Ac>

- Volunteer SWOT Plan Presenter, City of Keithsburg Development Charette, Upper Mississippi River Action Conference, Moline, Illinois. 27 August 2010.

- Website, Brand, and Newsletter Designer Volunteer for Great River CSA (Community Supported Agriculture), Quincy, Illinois, 2008-2010.

University Service: Administrative

- Teaching Mentor, ICaP, Purdue University, 2015-2016.

- Advanced Placement Test Rater. Educational Testing Service (ETS), Kansas City, Missouri, June 2015.

- President & Annual Conference Organizer, English Graduate Organization (EGO), Western Illinois University, 2010.

- Administrative Staff, Center for East European Studies, Center for European Studies, European Union Center, and Center for Middle Eastern and North African Studies, International Institute, U. of Michigan, Ann Arbor, 2005-2007.

Initiatives and Committees

- Service Learning Initiative Committee Member, Purdue University, 2012 – 2015

- Webmaster, UR@ Syllabus Approach, Purdue University, 2012 – 2013

- Program Initiative Committee Member, Purdue University, 2012 – 2013, 2014 – 2015

Professional and Technical Writing Experience

- Website, Print Ad, Business Card, and Brand Designer for Flextime LLC, South Bend, Indiana, 2015. <http://www.flextime.biz>

- E-Book Editor and Designer, Training: Body, Mind, and Spirit - A Reference Guide to Being Your Best, Flextime LLC, 2015 <www.flextime.biz>

- Editor and Designer, Alumni Newsletter, Center for Middle Eastern and North African Studies (CMENAS). International Institute, University of Michigan, Fall 2006. <http://tinyurl.com/na9vx8o>

- Designer and Editor for Business and Technical Documents (as part of past non-academic work experience): grant applications and reports; financial reports for executives and boards of directors; bookkeeping and employee manuals; newsletters, press releases, flyers, and postcards; executive powerpoint presentations; affirmative action reports; advertising layout and copy; architectural specification books; annual fundraising campaign letters; letters, memos, faxes, and emails; conference and event signage; 1994-2007.

Computational Literacy

- Certificate, Digital Creativity in the Classroom, Adobe Education Exchange, 2015
  Participant, Professional App Development, Adobe Education Exchange, 2015
  Participant, Rails Girls, Chicago, 2012 <http://railsgirls.com/chicago>
  Operating Systems: Microsoft Windows, Mac OS X, Ubuntu/Linux

- Adobe: InDesign, Photoshop, Muse, Premiere Pro, Dreamweaver, PhoneGap, Behance, Kuler Microsoft: Word, Excel, PowerPoint, Access, MovieMaker

- Mac: XCode, iMovie, iBooks, GarageBand

- Other Applications: OpenOffice and LibreOffice, Gimp, Kompozer, Processing, R, Audacity, Buzztouch, Ragic, Evernote, Brackets, GoogleDocs, Prezi, Screencasting, YouTube Editor

- Content Management Systems: Drupal, Blackboard, Blackboard Learn

- Markup/Coding: HTML5, CSS, Javascript, jQuery, jQuery Mobile, Ruby on Rails, Cake PHP

Graduate Coursework

Teaching Practica

- ENGL 505A – Teaching First-Year Composition 1 (Thomas Rickert)

- ENGL 505B – Teaching First-Year Composition 2 (Thomas Rickert)

- ENGL 505M – Professional Writing Practicum (Michael Salvo)

Rhetoric and Composition

- ENGL 591 – Introduction to Composition Theory (Samantha Blackmon)

- ENGL 622 – Issues in Composition Studies, Classical to Renaissance (Richard Johnson-Sheehan)

- ENGL 624 – Issues in Composition Studies, Modern Period (Patricia Sullivan)

- ENGL 625 – Empirical Research in Writing (Patricia Sullivan)

- ENGL 626 – Issues in Composition Studies, Postmodern Period (Thomas Rickert)

- ENGL 681/IDIS 591A – Hutton Lectures in Rhetoric and Composition (Various)

- ENGL 699 – PhD Dissertation Research (Jennifer Bay, Patricia Sullivan)

Professional & Technical Writing

- ENGL 619 – Qualitative Research (Dwight Atkinson)

- ENGL 680 – Professional Writing Theory (Michael Salvo)

- ENGL 680 – Public Rhetorics (Jennifer Bay)

- ENGL 680 – Experiential Learning and Engagement Theory (Jennifer Bay)

- ENGL 690 – Visual Rhetoric (Michael Salvo)

Rhetoric, Technology & Digital Writing

- ENGL 605 – Computers, Language and Rhetoric (Michael Salvo)

- ENGL 680 – Digital Studio (Nathan Johnson)

- ENGL 680 – Cultural Studies and Composition (Thomas Rickert)

- ENGL 680 – Posthumanism and Rhetoric (Thomas Rickert)

Master's Level Coursework

- ENG 400G – Tolkien and the Great War (Margaret Sinex)

- ENG 532 – Literature and Place: Ecocriticism (Peggy Otto)

- ENG 536 – Narrative Theory (David Banash)

- ENG 549 – Booker Novels (Marjorie Allison)

- ENG 574 – New Media Theory (C. Bradley Dilger)

- ENG 620 – Independent Study: Readings in Critical Theory (Andrea Spain)

- LAS 503 – Literature and Philosophy: The Human and Its Others (Andrea Spain)

Academic References

- Dr. Jennifer Bay <jbay@purdue.edu> . Associate Professor of English, Director of Introductory Composition. Purdue University, West Lafayette, Indiana

- Dr. Patricia Sullivan <sullivanatpurdue@gmail.com> . Professor of English, Director of Rhetoric and Composition. Purdue University, West Lafayette, Indiana

- Dr. Thomas J. Rickert <trickert@purdue.edu>. Professor of English. Purdue University, West Lafayette, Indiana

- Dr. Michael Salvo <salvo@purdue.edu> . Associate Professor of English, Director of Professional Writing. Purdue University, West Lafayette, Indiana