Exercising Uncertainty:
Identifying and Addressing "Gray Areas" in a Case Study Involving Corporate-Funded Research on the Effects of Sugar-Sweetened Beverages

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Rhetoric of health and medicine (RHM) scholars posit that health and medicine texts cannot be divorced from the rhetorical conditions in which they are shaped and disseminated. This assertion runs counter to traditional biomedical values grounding messages about the body in positivist evidence and universal standards. As this issue of the founding journal in RHM demonstrates, a disciplinary response to a biomedical ideology should undergird not only the approaches scholars take to their research, but also the models of learning they bring to the classroom. In this essay, I present a case study assignment used in an undergraduate science writing course that aims to encourage critical thinking skills that extend beyond dichotomous understandings of both the material body and knowledge-production influencing how the body is situated in institutional settings. Following a discussion of relevant RHM scholarship, I provide details about the institutional context in which I work, a description of the assignment developed for this student population including sample student responses, and consideration of the strengths and limitations of the approach alongside strategies for adapting the assignment to other student populations and environments.

RHM's EMPHASIS ON FLUIDITY AND UNCERTAINTY

RHM scholars are a rebellious lot, united in their desire to interrogate the narratives through which knowledge about the body is constructed and conveyed. Studies in the field play out against a combative backdrop in which the deviant body is surveilled under a watchful authoritative gaze and targeted by therapies deployed to destroy the enemy of health, whether a virus, an unexpected conglomeration of cells, or a mutilation of the ideal corporeal landscape.

At one time or another, all human bodies are called to engage in this antagonistic setting, a truth that reveals the need to equip ourselves and our students (among other publics) with alternative conceptualizations of bodily states.

In response to the polarizing construction of bodies in traditional medical spheres, J. Blake Scott and Lisa Meloncon (2018) note that RHM work represents a "range of disciplinary and interdisciplinary bodies of scholarship" more invested in "advanc[ing] knowledge in an indeterminate manner" than committed to "align[ing] and standardiz[ing]" (pp. 3-4) a rigid set of practices. In their pursuit of knowledge, RHM scholars open themselves to divergent ways of seeing as a means to offer a multitude of arguments pertaining to health and medicine, some of which unsurprisingly usurp dominant understandings.

In short, a biomedical perspective represents a static orientation towards the body and states of health and illness. Doctors, for example, are taught to isolate and examine the physical body in concert with the specific patient complaint, and then to compare their findings to other "normal" and "deviant" bodies in the quest for an accurate diagnosis and potential fix. In modern times, the "medical gaze" chronicled by Michel Foucault (1973) finds plentiful support for expert interpretations, particularly in the context of a sophisticated technological landscape where visualization of the body is presented as unbiased evidence in the decision-making process. The "rub" of this approach to peering inside and making sense of the corporeal specimen, according to Christa Teston (2017), is that "in the time it takes to visually evince disease, the evidential artifact itself becomes a kind of relic" (p. 27) given the complexities and fluctuations endemic to human bodies. T. Kenny Fountain's (2014) description of the "contemporary anatomy lab" where "future doctors, dentists, physical therapists, and nurses encounter the cadaveric body of traditional Western medicine—the body that is anatomical knowledge made flesh" (p. 24) offers a postmortem perspective on the use of rhetorical devices to influence how the singular body lying before students offers explicit knowledge about bodies in general—both their makeup and the value they provide to the work of the living.

Widespread assumptions about the certainty of scientific research findings also play a pivotal role in the acceptance of clinical decision-making practices. Historically, the "hard" sciences, especially, have been characterized by investigators' commitment to objectivity in

both methodological protocols and interpretations of data. These claims of non-bias, despite recognition of limitations and use of qualifiers in conventional Introduction, Methods, Results and Discussion (IMRD) arguments, fuel perceptions of scientific data as "correct" in the public, and ideally to a lesser extent, the scientific, domain. From a rhetorical standpoint, scholars including Jeanne Fahnestock (1998) articulate the genre work driving both scientific inquiry and the presentation of research data by "science accommodators" (p. 334), challenging the notion that scientific facts and reasoning are neutral and somehow more "real" and reliable than knowledge discovered through assumedly less rigorous methods. Nevertheless, admissions of gray areas and problematic findings, a necessary feature of sound argumentation, are regularly glossed over in communication of scientific knowledge. RHM scholars often work in these "gray areas" to elevate and make visible uncertainties that are not only ignored by many, but also contribute to social inequities and unjust practices. As educators of both students entering science and medical fields and those pursuing other academic and career paths, our work in RHM exposes an ethical responsibility to introduce variations to dichotomous understandings of the body as object into the classroom.

INSTITUTIONAL CONTEXT

I have used versions of the assignment discussed in this essay in numerous sections of a science writing course that I initially developed in 2005 when the [redacted], a Research I institution, launched its Science and Technology Honors Program (STHP). The course is offered at the freshman level, and students enroll in a designated section of either EH 102 (the research-based writing course required for all university students) or EH 202 (for those who have previously earned credit for 102 but not taken a course focusing on the conventions of scientific discourse). While the assignment that I describe in this essay was developed with this particular population in mind, the assignment itself and variations on the principles driving the assignment can be adapted to diverse student groups. The ethical imperative to engage students participating in the medical sphere from a host of positions makes this approach relevant to many institutional settings.

Acceptance to STHP is competitive, and students pursue diverse majors: chemistry, biology, physics, biomedical engineering, neuroscience, genetics, public health, and computer

science, to name a few. Many enter [institution] under the Early Medical School Acceptance Program, ensuring them a spot in the institution's highly ranked medical school following graduation. STHP applicants undergo a rigorous review process (demonstrating excellence in academic preparation and a keen interest in research), and throughout their time in the program, they enroll in seminars addressing methodological approaches to scientific inquiry; work in on-campus labs and clinics, contributing to innovative research, grant applications, and published papers; and produce and defend honors theses reporting on their contributions to current conversations in science and technology. The majority of STHP graduates continue their education in Ph.D., M.D., and combined M.D./Ph.D. programs at institutions across the country. STHP students are consistently named as recipients and finalists for awards including the Rhodes, Clinton, Marshall, and Fulbright Scholarships. I provide this information not just to brag on the students--though bragging is always a delightful perk of the job--but to suggest the caliber of the students enrolled in the course. It is important, I think, to acknowledge that many of them have landed in STHP and continue to excel in part because of their success in achieving benchmarks of learning that value objective measurements of knowing. In brief, these are students who have played by the rules, the ones rewarded for answering questions in the "right" way and adhering precisely to the requirements of an assignment. Many find it downright uncomfortable to dwell in the land of uncertainty, a place to which my course, and this assignment in particular, is designed to transport them. The prioritizing of "correct" answers and absolute understandings is certainly not limited to students in my course, however. Students across academic institutions have encountered positivist pedagogy, and despite efforts to widen their perspectives on gradations of knowledge and the complexities of learning, many continue to embrace the idea that an education can offer unwavering expertise in a variety of subjects.

A CASE STUDY ASSIGNMENT

Case studies as a pedagogical approach have a rich history in fields including business and medicine, offering students the opportunity to step into realistic scenarios presenting complexities—including gaps in knowledge and plenty of gray areas suggesting uncertainty—

that necessitate critical thinking. The specific case assignment described in this section draws on principles of fluidity and uncertainty addressed widely in RHM scholarship. While several dilemmas are presented in the case scenario, the assignment hinges on a disagreement between researchers about how to report on a corporate-funded study that suggests the negative effects of even moderate consumption of sugar-sweetened beverages (SSBs).

Rationale and Materials

My rationale for developing this case study is that one of the best ways to engage students in the complexities and uncertainties of knowledge is to situate them in conversations centered on "wicked problems," a term used by Horst Rittel and Melvin Webber (1973). Such problems, according to S. Scott Graham (2019), are "marked by complex intersecting socioeconomic and/or biogeophysical causes" that "constitute real and immediate threats to humans, nonhumans, societies, and ecologies"; Graham points to examples including "climate change, the obesity epidemic, plastic pollution, [and] the opioid crisis" (p. 446). "Wicked problems" are embedded in robust multifaceted debates featuring ideologically opposed parties using "facts" in strategic ways to make their voices and their positions heard. And these problems present matters of urgency that cannot simply be swept under the rug given their threat to the existence of humans and nonhumans alike. Drawing on the work of Jenny Edbauer (2005), the "rhetorical ecologies" surrounding the many entry points for deliberation of "wicked problems" must be acknowledged and addressed by citizens, scientists, policymakers and others intending to participate informedly and ethically in the debate.

While students have typically been instructed in the merits of "critical thinking," too seldom are they asked to engage in activities that reward them for putting together ideas in "out of the box" ways or for rethinking how to approach the requirements of an assignment to better meet the needs of a particular audience. The case study presented in this essay provides far more gray areas than indisputable Truths, forcing students to contend with the unknowns and what-if's in strategizing a response. Plus, the class is told that successful responses are those that do not reflect polarized thinking; the student population with which I am working strives diligently to follow the rules and therefore hesitates to reach for complete and correct solutions to a situation that is mired in problems for a host of stakeholders.

The complexity of both the conversation presented in the assignment and the stages through which student groups progress requires prior and continued exposure to the principles guiding the assignment. The case study is assigned in the third week of the semester, since one pedagogical purpose is to introduce students to the multiple moving parts that contribute to scientific knowledge and communication before they embark on other projects. Students complete the assignment collaboratively, reinforcing the message that science is a social endeavor. They also approach the assignment having participated in discussions and activities like the following:

- During the first week, the class discusses the role paradigms play in influencing which questions scientists ask and the motivations driving these questions. Students are introduced to Thomas Kuhn's (1996) work on the stages through which social and scientific paradigms progress and are assigned to write a one-page position statement offering evidence of a current paradigm operating in society drawing on a current news article about a scientific discovery.
- Depending on the semester, the class either reads selections from Naomi Oreskes and Erik M. Conway's (2011) book *Merchants of Doubt* or watches the 2015 documentary by the same name during the second week of the semester. "Merchants of doubt" are persuasive pundits who peddle skepticism through media platforms and organizational thinktanks. They sow doubt about credible scientific evidence leading to educated consensus, for instance, data supporting global warming and the ways in which certain human behaviors contribute to the problem. The tactics employed are diverse, but often involve reframing issues and thus misrepresenting what is known/unknown as well as which questions of value pertain to a particular issue. The latter provides an opportunity to discuss *stasis* and its influence on how writers shape arguments for better or worse as explored by Adele H. Hite and Andrew Carter (2019) in their discussion of the construction of science policy. One conclusion reported by Oreskes and Conway (2011) is that sowing doubt has less to do with refuting viable evidence than with a rejection of findings that might lead to social regulation. The desire to cast doubt, in such instances, is rooted in oppositional political ideologies rather than

disagreements about the reliability of scientific data. Also, "merchants of doubt" oftentimes have ties to industry like big tobacco, suggesting the economic stakes that permeate discussions of complex problems. These considerations are relevant to the specific scenario in which students engage in the case assignment.

- Finally, as part of introducing the case, I require students to read selections that represent the complexity of the conversation around which the assignment is centered. These readings are assigned so that students can see for themselves that the debate over the health benefits and drawbacks of consuming SSBs is, indeed, a "wicked problem" (Rittel & Webber, 1973). Also, the range of questions posed in the selected readings provides students with numerous options for entering the conversation while understanding which expert and public-facing stakeholders might be most invested in the issues they choose to address.

Reading selections vary somewhat each time I teach this case, and I usually assign no more than ten articles to students since they are simultaneously constructing their own perspectives on the scenario presented. Since this number of articles does not always present the continuum of interlocking concerns that I hope students will consider, we spend some time in class and through the online portal sharing ideas about other, often overlooked, questions that might be relevant to the case. One example would be asking students to consider the effect of their character's strategy on an audience of children as opposed to adults or on communities living in poverty as opposed to those who enjoy food security. My goal is to provide a spectrum of ideas related to industry-funded research on the effects of consuming SSBs stemming from multiple disciplinary and other situated stances. The scope of potential reading selections reflecting the "rhetorical ecology" (Edbauer, 2005) driving this particular "wicked problem" (Rittel & Webber, 1973) looks something like this:

<u>Perspectives on industry-funded research:</u> George Monboit, 2006; Craig W. Moscetti and Allyn L. Taylor, 2015; Gary Sacks, Boyd A. Swiburn, Adrian J. Cameron, and Gary Ruskin, 2017; Paulo M. Serodio, Martin McKee, and David Stuckler, 2017

Criticisms of the SSB industry: Anahad O'Connor, 2015, 2016; Marion Nestle, 2015

Responses from the SSB industry: Ed Hays, 2015; Tate Mitchell, 2018; Donald Short, 2005

Discussions of neoliberal health and stigmatization of populations around "the obesity problem": Alexandria Brewis and Amber Wittich, 2019; Robert Crawford, 1980; Kathleen LeBesco, 2004, 2010; Megan M. Ringel and Peter H. Ditto, 2019

Samples of scientific studies on SSBs and health: Bernard C.K. Choi, David J. Hunter, Walter Tsou, and Peter Sainsbury, 2005; Anna H. Grummon, Natalie R. Smith, Shelley D. Golden, Leah Frerichs, Lindsey Smith Taillie, and Noel T. Brewer, 2019

Responses to all of the above by scientists, health care professionals, policy experts and advocates: Daniel G. Aaron and Michael B. Siegel, 2017; Jeffrey B. Koplan and Kelly D. Brownwell, 2010; Elisabeth Mahase, 2019; Sarah Steele, Gary Ruskin, Martin McKee, and David Stuckler, 2019; David Stuckler, Gary Ruskin, and Martin McKee, 2018; Union of Concerned Scientists, n.d.

Work produced by RHM scholars: Colleen Derkatch and Phillipa Spoel, 2017; Elisabeth Miller, 2019

Scenario, Roles, and Deliverables

This collaborative case study involves an existing corporate funding sponsor (The Coca-Cola Company) and a fictitious research team affiliated with the equally-fictitious University of Carbonate in Carbonate, Idaho (see **Appendix** for the complete assignment). In 2005, then-Vice President of The Coca-Coca Company Donald Short argued the "proactive role" the company had adopted in ensuring a healthier tomorrow for consumers. Published in *American Journal of Clinical Nutrition*, Short's article—drawing on a presentation he made at a 2004 symposium focusing on academic, government, industry, and health care responses to the obesity problem (an example of Graham's (2019) point that multiple stakeholders convene to address problems that defy simple solutions)—revealed the four-pronged approach adopted by Coca-Cola to improve public health: "1) product innovation to provide more beverage choices and variety; 2)

programs and policies, particularly in the schools; 3) physical activity, nutrition, and lifestyle education programs; and 4) a science-based Beverage Institute for Health and Wellness" (BIHW) (Short, p. 2565S). The constructed narrative places students in the role of Dr. Sam Harrison, a nutrition researcher who is part of a research team investigating the health effects of consuming sugar-sweetened beverages (SSBs) and benefitting from funding provided by the BIHW. As revealed in the case scenario, a number of central issues emerge from the partnership between Dr. Harrison and the BIHW, including, but not limited to, the following:

- The Coca-Cola Company's foundational formula for health is based on the theory of "energy balance," the idea that weight (the primary signifier of a healthy body according to Coca-Cola) can be managed through the equal consumption and expenditure of calories. Weight/health is thus an individual problem, a perspective drawing on a neoliberal perspective and the associated stigmatization that results from not achieving public measures of "good health" (Brewis & Wutich, 2019; Crawford, 1980).
- Findings from the research study conducted by Dr. Harrison and her colleagues suggest serious health risks associated with the moderate consumption of SSBs. Beyond weight gain, a central concern for Coca-Cola, the team discovers an increased risk of severe liver damage in individuals diagnosed with diabetes. While the rest of the team wishes to downplay these findings, Dr. Harrison believes that the data should be fully disclosed in a forthcoming publication despite the possibility that the report will ruffle feathers at Coca-Cola.
- Dr. Harrison's acceptance of research dollars from the BIHW as well as Harrison's contributions to the work have already been shared in professional forums. The publication on which the team is currently working, and on which they disagree regarding the claim to be argued, is the most important to date in terms of substance and reach in the team's contributions to conversations about SSBs and health.
- Dr. Harrison occupies other roles that increase this party's stakes in the scenario; for example, Harrison is an untenured junior member of the research team and has built a reputation in Carbonate as a community health advocate.

- The team is conducting research in a climate of decreased traditional funding opportunities and widespread discussion about the perils of accepting monetary support from corporate sponsors.

Fluidity is built into the case assignment so that student groups can reasonably shift the question "What *should Dr. Harrison* do?" to "What *would you* do?" Groups may make assumptions about Dr. Harrison's gender, race, sexual orientation, religious beliefs, etc. to better connect with the central character. My goal is for students to place themselves in the scenario and from that position to think through (and implement) a necessarily partial response that will showcase their ability to navigate a difficult situation to which there is no clear and certain solution. While two of the deliverables required are polished professional documents written to stakeholders identified in relation to the case scenario, perhaps most important is the rationale the group provides to explain their decision-making process. As shown in the examples that follow, students adopt several strategies that engage them in gray areas. As a result, they are tasked with developing strategic responses that are reasonable and sensitive to the needs of stakeholders while not overstating "truths" grounded in uncertainties, for example, the limited data Dr. Harrison's team has collected to date and assumptions about how the corporation funding the team's research might respond to their findings.

STUDENT RESPONSES

Challenging polarized notions of uncertainty as inherently "good" or "bad."

In our examination of "merchants of doubt," students often detect apparent contradiction in our class discussions. While "merchants" sowing doubt about research findings that have reached some degree of consensus in scientific communities are frequently demonized in public and scholarly spheres, scientists earn respect for challenging agreed-on conclusions about complex problems. Students pose an excellent question: Is there a double standard at play? The query is particularly insightful when it follows a viewing of the documentary *Merchants of Doubt* (2015), since students detect the intentional use of dramatic effect to make persuasive pundits look and sound especially foolish.

Students' concern about a potential double standard provides an opportunity to examine the differences between "merchants of doubt" who address any number of complex issues and scientists who draw on others' research to attempt to poke (or address) holes in current knowledge.[1] One pivotal difference, among many, is the openness to new knowledge and new perspectives demonstrated in scientific discourse whereas merchants of doubt build walls of resistance to disavow information founded on solid methodologies and nuanced arguments. This discussion also leads to a consideration of the "uncertainties" and "fluidity" of knowledge in any context and the conventions followed in disciplinary communities to demonstrate a persona of ethos in scholarly conversations.

Indicating their understanding of conventions of mutual respect among scientists and the social nature of scientific discovery, students frequently consider the work of disciplinary colleagues to be an important component of Dr. Harrison's strategy. For example, Mike, Toby, and Anna decided that "Dr. Harrison [would] reach out to her mentor/advisor from a previous institution for advice," after she, along with other members of her research team, examined "some [prior] research papers" revealing similar studies and/or findings about the risks of SSB consumption.[2] Incorporation of these steps suggests an awareness of the usefulness of questioning research findings (i.e., of playing the role of skeptic) as well as an acknowledgement of the disciplinary communities within which scientists create knowledge.

Acknowledging and respecting multiple and co-existing stakeholder perspectives.

As students consider the complexity of audiences, many recognize the multiple roles stakeholders might adopt that are related to the issues revealed through the scenario. While the scenario states that Dr. Harrison is a trained biochemist, member of a department of

[1] One pattern identified in Oreskes and Conway's (2011) book and the 2015 film based on the book is that "merchants of doubt" sometimes make a living out of casting doubt about the legitimacy of scientific research on a variety of hot topics. A single ambitious "merchant" might speak out on issues ranging from climate change to smoking to flame-retardant treatments used on baby clothes and mattresses. Since the tactics employed by these individuals often involve critiquing regulations or individual freedoms at risk given scientists' claims—and not the science itself—the reach of claimed expertise is perhaps unsurprising.

[2] Students provided permission to the author for all work discussed in this essay. Also, while the assignment materials I have written use gender-neutral pronouns, I rely on students' pronoun use for Dr. Harrison in this section.

nutrition, and community advocate, they might also be a parent and maintain a popular blog addressing health issues. It's possible that Harrison is a good friend of another researcher on the team and can therefore speak with the individual in a less formal setting. In brief, Dr. Harrison's identity is fluid, not fixed. These and other assumptions can be made when working with a case study, as long as they do not contradict information provided in the scenario or assignment instructions.

In their response, Olivia and Blake chose to add a role for Dr. Harrison, sister to Rebecca. In an appeal to her research team, Dr. Harrison presents a personal story about her sister's struggle with Type II diabetes, worsened by her addiction to SSBs (even after her doctors encouraged her to stop drinking these beverages). In a personal exchange, communicated via email, Dr. Harrison reveals to her colleagues that she has "been conflicted regarding the interpretation of our results," a conflict grounded in her sister's struggles that led to Dr. Harrison's "passion for [a career in] nutrition." This personal story is not intended to replace a professional exchange of ideas with Dr. Harrison's team and the decision they make about publication of their study, but it does serve as an additional layer of communication helping to explain Dr. Harrison's perspective on the situation. She notes that watching Rebecca struggle with "fatigue, blurry vision, and excessive thirst," among other symptoms, demonstrated the realities of diabetes that are too often portrayed inadequately in the "pages of a textbook."

Reassessing and reframing norms.

During their initial reading of the case scenario, most groups arrive at conclusions revealing their acceptance of cultural norms. Fat means poor health. Corporations are greedy. Scientists are unbiased in their quest for the truth. These norms reflect tendencies to examine uncertainty or gradations of what is considered to be True as "bad," as something to be conquered by allegiance to what is known, to what is without a doubt factual.

One group decided to shift some of the stigma away from "fatness" in their strategy. Dr. Harrison joins members of the community to develop a program called "Health First," driven by the slogan that "health" is achieved and measured by many, many factors--not just a number on the scale. This group struggled to find a workable strategy for communicating the results of the research on SSBs to a professional audience, complicating the effectiveness of the "Health

First" program as a consistent approach that reinforces Dr. Harrison's ethos. Nevertheless, the idea does suggest some awareness of the damage that can be caused by an overemphasis on "obesity" as the most important, if not sole, component of health.

Nudging the dial to move beyond "big narratives" and "S"olutions.

One of the greatest challenges in the class is convincing students that Dr. Harrison does not have to "fix" the situation. Sans a magic wand, it is unrealistic to think that Dr. Harrison could remedy all of the problems stated and implied in the scenario. Instead, students are instructed "to improve the situation, however slightly, without dismissing the problems suggested by the scenario" (Appendix). That means locating and isolating smaller problems or micro-narratives to address, assuming that "wicked problems" (Rittel & Webber, 1973) require the gradual peeling back of interlocking layers.

As Leanna, Jung Vin, and Amy hashed out the dimensions of the case scenario, they identified two threads that might be addressed simultaneously. Dr. Harrison was running out of time to build a case for tenure at the University of Carbonate (and had counted on the study undertaken with funding from the BIHW to provide the push needed to apply). And the current study results, if reported ethically, would likely lead to backlash from The Coca-Cola Company as well as members of Harrison's disciplinary community. These students took a two-tiered approach: Request an extension of the tenure clock while persuading the team and investors from the BIHW to fund further research looking at some of the other, reportedly "healthier" beverage products manufacturer by Coca-Cola. They based their/Dr. Harrison's argument to corporate representatives on the limitations of the current study (a convention of scientific writing that we had discussed) alongside the benefit to all stakeholders if the team reassesses the data while building on their work with a follow-up study (involving identification of additional products and variables). While it's tempting to dismiss the group's strategy for simply delaying the problem, Leanna, Jung Vin, and Amy argued in their rationale that these dual approaches side-step the larger problem of losing credibility with one or more parties and, in the process, allow additional time for the team to investigate claims made about other

products like flavored waters and programs devised by their corporate sponsor while also providing Dr. Harrison an opportunity to seek funding from other sources.

ASSIGNMENT STRENGTHS, LIMITATIONS, AND ADAPTATIONS

The greatest limitation or "weakness" of this assignment is also its strength. Students submit responses that reveal gaps in their thinking or gravitate towards the few hints of absolute information in the case scenario. They ignore the possibility that the frustration Dr. Harrison communicates to their mentor might be shared with other members of the research team or that a local health fair organized by Dr. Harrison that provides information contradicting the thrust of the team's published work might undercut their credibility. Groups sometimes overstate the significance of the team's findings from a single study and utilize rhetoric that is unduly polarizing as a result, pushing aside our conversations about the incremental shifts and qualified claims that characterize sound scientific arguments. Students opt for a communication strategy that inadvertently reinforces stigma. Given the complexities of the "wicked problem" students are asked to address, it is inevitable that their responses will lead to recognition of more gaps and uncertainties.

But allowing students to make "mistakes" is the point of this assignment. It is an indicator of success. Stepping into Dr. Harrison's shoes and facing an untenable predicament, students are challenged to accept and work within the unknown. They may lament that their projects are not perfect, or insist that the assignment is not fair because there never was a "correct" answer. But their lapses in judgment and oversights regarding how a strategy adopted by Dr. Harrison might make the situation worse open possibilities for exploring the many what-if's that students will likely encounter in their careers. Discomfort can be interpreted as a sign of growth. Physician-scientists like Alexander K. Smith, Douglas B. White, and Robert M. Arnold (2013) reflect a trend towards challenging the tidy diagnoses and prognoses that too many practitioners feel compelled to share with patients. Instead, the authors insist that "uncertainties" should be acknowledged and encouraged in medical schools. Not knowing, or continuing to question what seems fairly certain, leads to more robust inquiry. A physician's commitment to asking questions and being open to gray areas in evidence collected should

have some bearing on the "grade" assigned to their efforts. In turn, the rigor of the thinking process demonstrated by groups in response to the case assignment comprises a significant portion of my evaluation.

While the student population at [institution] may be dissimilar in some ways to those taught by other RHM scholars, the principles on which this case assignment draws can be incorporated into diverse pedagogical settings. It is not enough to instruct students to think critically and to operate with the understanding that knowledge is in a perpetual state of flux. Rather, it is important to immerse students in the conversations that circulate around "wicked problems" (Rittel &Webber, 1973) to engage them firsthand in the shifts and gaps that characterize insurmountable challenges like "plastic pollution" or "the obesity epidemic" (Graham, 2019, p. 446). Citizens, health consumers, students, and professionals in a host of fields could all benefit from attempting to navigate what appear to be insurmountable problems.

This assignment can be adapted in two specific ways to better meet the needs of diverse learners or institutional settings. One option is to introduce students to rhetorics of uncertainty through in-class activities or other small stake assignments. I often engage students in a continuum exercise in which each group draws a continuum and places extreme positions on a controversial issue on each end. For example, if the continuum reflects conversations about free speech, one end of the continuum might represent complete freedom to do or say anything—no rules, no penalties. On the other end would be a society in which every single action is subject to censorship—no freedoms of expression whatsoever. The task for each group is to identify as many positions and the accompanying stakeholders who would be affected by these positions between the two extremes as possible, determining placement of these negotiated perspectives along the continuum. This exercise reveals the assumptions we make when we "choose a side" and the gaps and uncertainties that we may not entertain when crafting an argument.

A second option involves selection of another "wicked problem" (Rittel & Webber, 1973) that might resonate with a particular student population. The specific conversation should relate to students' disciplinary interests or involve issues in which they are invested. For

an engineering communication course, I developed a case study assignment focusing on conversations around new sources of energy. Business writing students tackled a case addressing the rights of animals and the expectations of visitors to a place like Seaworld. In building a case study assignment, it is important to do substantial footwork to identify the scope of representative voices and positions that should be represented in the materials students are given. I have also occasionally asked student groups to bring in an additional reading representing a perspective that I have not provided to them. My own gaps in knowledge and blind-spots are made transparent in these instances.

RHM scholars and teachers owe it to ourselves and our students to make sure that some "aha" moments are those that illuminate not just what we know, but what we do not.

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