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Values as the Bridge over Troubled Disciplinary Waters

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We live in a world riddled with complexity; the closer we examine what we think we know, the more we recognize the limits of our knowledge. This practice is known as epistemic humility and, while it is admittedly daunting, it is one of the most intriguing aspects of science. While common perceptions of science place science on a pedestal of certainty and objectivity, epistemic humility reveals the inherently uncertain nature of scientific knowledge. Moreover, there is a disconnect between normative misconceptions of science as an objective and certain practice that produces concrete knowledge and the descriptive uncertain nature of science revealed via epistemic humility. One of the best ways to help close this epistemic divide is through the incorporation of values and interdisciplinary practices. By debunking the myth of absolute objectivity in science and incorporating epistemic values, we can further the conversations about scientific practice and improve our ability to work collaboratively. In this essay I will argue that not only does rejecting the value-free ideal better science, but it also strengthens interdisciplinary work, which is becoming increasingly critical in our current climate of multifaceted issues. To make this argument, I will begin with an analysis of the value-free ideal, followed by an evaluation of interdisciplinarity within science, and conclude with an extension of the implications of rejecting the value-free ideal on interdisciplinarity.

In order to understand the rationale behind rejecting the value-free ideal, we must first understand its origins and why it is currently considered to be entrenched in scientific practices. According to Heather Douglas, an associate professor of philosophy at the University of Waterloo, the value-free ideal describes the belief that only epistemic values, such as generalizability and replicability, are acceptable in internal stages of science in order to preserve 'objectivity' (121). Non-epistemic values, such as political and social views, are separated from the internal workings of science in accordance with the value-free ideal. However, as noted by Douglas, this separation is not attainable nor desirable in a descriptive or normative context due to its inaccurate representation of the scientific process, influence on manufactured scientific controversies, and impact on our understanding of objectivity (121).

Douglas' suggestion of rejecting the value-free ideal faces the difficult barrier of changing the public perception of impersonal science that was established in literature before the 1970s. Early writing from Robert Menton documented scientific norms as "impersonality" and "universalism" (qtd. in Mitroff 579). However, as further investigation and research was conducted, counter-norms including the "personal character of science" were established (Mitroff 579). The co-existence of conflicting norms and counter-norms in science prompted studies that

examine how science is conducted. One such study that highlights the need for the incorporation of values in science is Ian Mitroff's study of Apollo lunar scientists' behaviours and reflections about the scientific process. From the responses of these renowned scientists, three "commitments" in science arose: an intellectual commitment, an affective commitment, and an emotional commitment (Mitroff 586). The combination of epistemic values in the intellectual commitment and non-epistemic values in the affective and emotional commitments further display the "social ambivalence" of science and the need for the incorporation of values (Mitroff 579). Additionally, the study found that "every one of the scientists interviewed... indicated that they thought the notion of the objective [and] emotionally disinterested scientist naïve" (Mitroff 587). I believe that the nature of these commitments and the reflection upon the descriptive nature of emotions influencing science reinforces Douglas' rejection of the value-free ideal.

Secondly, the absolute separation of non-epistemic values from internal processes of science is not attainable. Science is inherently "value-laden" due to the influence values have on decisions in science, such as choosing what to study, how to observe and measure, and how to mitigate uncertainties (Douglas 122). Moreover, by rejecting the value-free ideal, "we can better understand the nature of scientific controvers[ies]... and help speed [the] resolution of those controversies" (Douglas 122). Manufactured scientific controversies occur when the public believes there is scientific dissonance on a topic when there is in fact consensus within the technical scientific community (Harker 193). These controversies stem from miscommunications and misunderstandings where values appear to be in conflict. In the anthropogenic climate change controversy, despite the scientific community's overwhelming consensus confirming anthropogenic climate change, there continues to be objection on the grounds of natural variation in weather patterns that some people "extrapolat[e] to long-term climate patterns" (Harker 189). This assumption is "enforced by our knowledge of past climates" and isproblematic as it misaligns the technical terms of 'weather' and 'climate', and ignores key scientific findings, including increasing levels of greenhouse gases (Harker 190). If we were able to discuss the values that influence our definitions of weather and climate and overall understanding of manufactured scientific controversies, I believe we would be able to decrease the number of misunderstandings that spark manufactured scientific controversies. By accepting and acknowledging the need for the incorporation of values in science, we better science by creating the necessary space for open-minded learning and discussion.

Douglas' rejection of the value-free ideal in scientific practice is reasonable and improves the quality of practice through her characterizations objectivity. One of the key concerns with rejecting the value-free ideal is the loss of objectivity: Douglas mitigates this concern by arguing for the maintenance of concordant objectivity (i.e. a group agreeing on an outcome) while incorporating values in science (Douglas 134). Douglas also shares the following claim from W.O. Quine, a philosopher renowned for his work on holism, who states: "The requirement of intersubjectivity is what makes science objective" (qtd. in Douglas 135). Quine's argument that objectivity is attained through intersubjectivity, the notion that areas of study share more than one disciplinary thought, creates a need for another type of objectivity: interactive objectivity. Interactive objectivity is attained by a group meeting and discussing what the outcomes should be and is more successful with the incorporation of values (Douglas 135). Interactive objectivity is also an integral aspect of interdisciplinarity as it promotes interdisciplinary collaboration which betters science by encouraging a diversity of as and perspectives explored through the discussion of values and personal qualities. Refuting the value-free ideal betters both science and interdisciplinarity as it creates space for interactive objectivity, which improves interdisciplinary collaboration.

To expand upon my argument that rejecting the value-free ideal betters science and interdisciplinarity, I will reflect upon academic disciplines and the meaning of interdisciplinary work. Academic disciplines are different areas of "organiz[ed] learning" that are composed of "accumulated specialist knowledge" and distinct methods of communication (Krishnan 9). Barriers between disciplines are difficult to define and incommensurable due to constant change and complex interactions between disciplines and sub-disciplines (Krishnan 7). Interdisciplinarity is the process of working between or across the disciplines, but given the aforementioned ambiguous definition, its implementation faces several challenges, including how to determine when we are crossing the boundary of a discipline (Krishnan 7). Despite the challenges that disciplinary structure poses to interdisciplinary work, I believe that it is beneficial to maintain disciplines to safeguard the structure of academia. Academic disciplines have an integral role in the present education system: educators worry that the elimination of disciplines would "demand too much" of students and make it more difficult to learn; it is difficult to integrate knowledge without a basic introduction to disciplinary knowledge (Krishnan 42). Additionally, if we were to eliminate disciplines, it would be challenging to find an instructor with the expertise to teach more than one subject due to our current institutionalized disciplines (Krishnan 43). Therefore, we must strive to conduct interdisciplinarity while maintaining the structural integrity of academic disciplines in order to effectively better science.

The relationship between structured academic disciplines and interdisciplinarity is one of complex dependency; interdisciplinary work depends on distinct disciplines. This complex dependency dynamic can pose a threat to effective interdisciplinary work. To counteract these challenges, Thaddeus Miller, an assistant professor at Arizona State University, and his colleagues proposed using epistemological pluralism as a framework for better interdisciplinarity (Social and Personality Psychology Compass 2018). Epistemological pluralism is described as "several valuable ways of knowing" and is significant to the argument for interdisciplinary work as "accommodating plurality leads to a more integrated study" (Miller et al 1). The use of epistemological pluralism to better scientific practice is illustrated in the discipline and subsequent subdisciplines of ecology. In her recent address, Dr. Cari Ficken, a postdoctoral fellow in ecology at the University of Waterloo, claimed that ecology is "multicausal", with many different areas to consider in its practice (2018). The inherently interdisciplinary nature of ecological practice benefits from the framework of epistemic pluralism, as the desire for interdisciplinary research leads to an improved understanding of the multiple epistemologies that influence ecology (Miller et al 2). But why does interdisciplinarity lead to an "improved understanding" of sciences such as ecology? Why is a more integrated study desirable? In the next section of my paper, I will examine the benefits of interdisciplinary work and argue that its implementation is desirable for improvements in science.

Interdisciplinary work is beneficial to science because it promotes ignorance, a "condition of knowledge" in which there is an "absence of fact, understanding, insight or clarity about something" (Firestein 5). This philosophical notion of ignorance improves the quality of scientific knowledge that is attained and disseminated because it allows for "uncertainty without irritability," which ignites the production of more questions, instead of answers (Firestein 17). The heightened scientific curiosity from question production makes scientists ask more and better questions, leading to new discoveries in science. In the context of epistemological pluralism, interdisciplinary work includes "unified problem formulation, sharing methods and the creation of questions" (Miller et al 3). Considering the value of creating questions in interdisciplinary work, ignorance improves scientists' ability to work between the disciplines and address increasingly complex and multifaceted problems. Despite the strength of ignorance in promoting

interdisciplinarity and subsequent improvements in science, I have noticed that the "absence of fact" and ambiguity of ignorance in science is often met with resistance. Those outside of the scientific communities, and even including some scientists, equate science with certainty and factuality when in reality, science is messy and operates under various levels of confidence, not certainty (Afshordi 2018). Further, I believe we need to exercise caution with the solidification of answers in scientific processes and start valuing curiosity and ambiguity. Answers stop scientific research, while embracing ambiguity and curiosity lead to questions that ignite new, interdisciplinary avenues for research.

Interdisciplinary work betters science through promoting dialogue between fields, which can in turn improve our ability to incorporate new knowledge and perspectives into scientific practices. Each scientist approaches their own science with a personal worldview and a specific disciplinary literacy that can prevent interdisciplinary studies and collaboration (Eigenbrode et al. 57). If we employ interdisciplinary practices and start to value the diversity of perspectives, scientists can gain new knowledge from a wide variety of disciplinary and personal ideologies that better the production and dissemination of knowledge in their respective disciplines, thus improving the quality of science.

Having explained the concepts of disciplines and interdisciplinarity in the context of epistemological pluralism, and the benefits of functioning between disciplines, I can now connect the value-free ideal to interdisciplinary work. In doing so, I will reveal how rejecting the value-free ideal betters interdisciplinary work and, as a result, science. Rejecting the value-free ideal improves interdisciplinarity as it eases the discussion of divergent worldviews to further interdisciplinary collaboration. The discussion of divergent worldviews and connection of values to interdisciplinary collaboration is facilitated in the Toolbox Dialogue Initiative. The Toolbox Dialogue Initiative (TDI) is a conversation tool that individuals use to enhance understanding of each person's values in order to promote respect and effective communication in interdisciplinary work (Michigan State University 2019). The focus on collaborative communication in the TDI promotes interactive objectivity as it establishes a method to mediate a conversation, allowing a group to determine how their values will shape the success of their project. In addition to encouraging interactive objectivity, the TDI functions to prevent one of the main barriers to interdisciplinary work: "interdisciplinary illiteracy" (Collins and Evans 29). "Interdisciplinary illiteracy" is the inability to speak the technical language of another discipline. Using the conversation tool promoted by the TDI improves one's ability to communicate between the disciplines, ameliorating the practice of interdisciplinarity in science (Collins and Evans 29).

Rejecting the value-free ideal also improves our ability to function within ignorance, which, as previously explained, improves interdisciplinary efforts. Given that science is often mistakenly associated with objectivity and certainty, rejecting the value-free ideal would encourage ignorance, therefore improving the facilitation of curiosity and focusing on the 'certainty' produced by answers. Furthermore, by incorporating epistemic and non-epistemic values, we are able to embrace the natural ambiguity of science and promote ignorance, which betters both science and interdisciplinarity.

While the previous sections of this paper have focused on why rejecting the value-free ideal improves science and interdisciplinary work, I will now briefly reflect as to *how* we could disregard the value-free ideal in contemporary scientific practices. I believe that one of the best ways to accomplish this is to be critically conscious of our social locations. Your social location describes where you are positioned in the "hierarchically structured system of power relations" in society and is strengthened by your recognition of this position (Wylie 31). If scientists heightened their sensitivity towards their social locations and the social domains in which

they conducted scientific research, I believe we would achieve improved philosophical ignorance and scientific research.

Additionally, acknowledging social location can improve one's ability to critically assess the knowledge they are presented. Acknowledging the reflective and philosophical nature of this paper, I note the limitations of my social location and in expressing alternative arguments and perspectives. I am writing this paper as a young, female student and recognize that my identity directly influences how I interact with knowledge (Wylie 27). I am limited in what I know by who I am. For future iterations of this paper, I believe that collaboration and the incorporation of other voices would be beneficial in strengthening the argument for the incorporation of values in science and the promotion of interdisciplinarity.

In conclusion, rejecting the value-free ideal promotes better science and interdisciplinary work due to the "value-laden" nature of science. Rejecting this ideal leads to an improved ability to function in ignorance, and to the encouragement of interdisciplinary dialogue that creates more space for interdisciplinary work. As a student studying in the interdisciplinary program of Knowledge Integration, I am pursuing interdisciplinary approaches to my learning and knowledge. I have noticed that my knowledge of the Canadian Charter of Rights and Freedoms from my Legal Studies course strengthens my understanding of policies (or lack thereof) surrounding euthanasia that have been discussed in my biomedical ethics course. Connections between courses have reinforced my recognition of the complexity of modern problems and the benefits of an interdisciplinary approach to these problems. While striving for interdisciplinarity in my studies may not yield the same depth of knowledge produced in disciplinary studies, I believe that there is great value to the breadth of my knowledge. My understanding of ignorance and the importance of values in knowledge acquisition has allowed me to make connections between disciplines and operate under ambiguity successfully. I believe a deep, disciplinary knowledge base would hinder this success due to its promotion of a singular method to approaching a problem that would instead benefit from diverse perspectives. Additionally, my pursuit of interdisciplinary practices has helped me maintain epistemic humility. I recognize that my peers who are pursuing studies in specific disciplines, such as law or ethics, will have more detailed and in-depth knowledge. These peers, however, may lack the ability of an interdisciplinary student to translate their knowledge across disciplinary boundaries, thus limiting the extent to which they can apply their knowledge. I look forward to continuing my pursuit of interdisciplinarity and working in a world of increasing complexity and beautiful uncertainty.

Author Biography

Ellen Taylor is a second-year student in Knowledge Integration. While she is interested in many subjects across the disciplines, Ellen is currently pursuing a French minor and a specialization in Science, Technology and Society.

Values as the Bridge Over Troubled Disciplinary Waters was written to reflect upon how values influence science practices. Ellen hopes to continue to explore the space for subjectivity in science throughout her undergraduate degree.

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