

Gender and Issues of Language in Science

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Key Words: Gender and science, Language and science, Feminist critiques of science, Feminism and science, Gender and language, Gender and education, Language and education

Abstract

It is difficult to intuitively grasp the language dependence between science and scientific knowledge at a first glance. Understanding how issues of gender permeate science by means of language is even trickier. In this paper, I will examine the ways in which language, science, and gender come together, and in the process impact and change each other, the effect of which are detrimental to both science and society. I have used the categories of science as culture, science as knowledge, and science as rhetoric in order to better understand the interdependence of these concepts. As actors in the field of education, an important first step is to become aware of these language mechanisms that go largely unnoticed. The different ways to utilise these perspectives can be explored collectively once we acknowledge the vicarious ways in which they impinge on our thinking and reasoning processes.

Language and Science

Though not apparent at first, language and science are intricately related to each other. The material world of which scientists ask questions and find answers to is first made available to them in their different languages. Examples of mathematical symbolism and visual representation such as diagrams and graphs may characterize scientific activity, but they have to be translated back to regular languages to be accepted as meaningful scientific knowledge. Moreover, the dominance of a language of scientific knowledge production and dissemination is governed by politics, wars and economics (Gordin, 2015).

In light of this background, I will examine the science-language dynamic through the lens of gender in this paper. My analysis rests on the notion of science as an expression of culture—a human enterprise for generating reliable knowledge about the world. Therefore, the role of language will be analysed against the social, political and cultural context of scientific activity by using the categories: science as culture, science as knowledge and science as rhetoric.

Science as Culture

Institutions of science have been frequently reported as being hostile towards women. They are described as possessing a "chilly climate", or being an exclusive "old boys club". From school classrooms to research organizations, learning and doing science have been considered difficult and inaccessible to girls and women. On the one hand, those who persist, particularly in the physical sciences, are humiliatingly labelled as "non-males"; on the other, a particular form of femininity, that of a "girly girl", is

considered antithetical to science (Shah, 2012; Francis, Archer, Moote, de Witt & Yeomans, 2017).

Scientific language has been shown to have a grammatical preference for passive voice and abstract nouns derived from verbs instead of the verbs themselves, both of which tend to make actual people/actors/subjects disappear. For instance, the phrases "experiments were conducted", or "data are tabulated", are common phrases indicating that no one in particular conducted the experiment or tabulated the data, and whoever did so holds no significance. Another such example can be found in the phrase "representation of a 3D orbital" (absence of an active verb form) versus "how do we represent a 3D orbital" (presence of an active verb form) (Lemke, 1990).

This style of language creates a strong contrast between the language of human experience and the language of science. It projects science as a simple and absolute description of the world with no human imprint whatsoever. Such a confluence of messages has been shown to alienate girls who are understood to be more interested in human relations and endeavours that are more social and communitarian (Brotman and Moore, 2008; Lemke, 1990). Further, not only does it repel some students because of this image, but it also attracts the ones it does on a false promise of knowing the world completely, certainly and absolutely.

Carol Cohn discusses the ubiquitous, unabashed and unapologetic use of sexual imagery in the language of American defence intellectuals (Cohn, 1987). She adds, "penetration aids" are bombers or missiles that get past the enemy's defensive systems, "holes" for placing the newest phallus-shaped missiles have to be "nice" and not "crummy", and the styles of missile attacks are framed as "protracted versus

spasm". She discusses that the euphemistic names of the atomic bombs dropped on Hiroshima and Nagasaki (Little Man and Fat Boy, respectively) were intentionally thought of as male progeny. Cohn asserts, "In early tests, before they were certain that the bombs would work, the scientists expressed their concern that they hoped the baby was a boy, not a girl.... That is, not a dud" (Cohn, 1987, p. 701). She concludes that this kind of male sexual imagery saturates the broader cultural context of the defense world and that the discourse of militarist science is laden with undertones of heterosexual domination and homoerotic excitement.

Science as Knowledge

Scientific knowledge is replete with models and metaphors that lends to the practice of theorising in science, despite a pervasive belief in the transparency and neutrality of scientific language. An analysis of two important scientific metaphors should alert us to the ways in which troublesome qualities of our culture, encoded in and carried by our language, become a part of scientific knowledge and the processes of scientific knowledge generation.

Emily Martin undertook a study of the scientific accounts of reproductive biology, and successfully demonstrated the centrality of cultural stereotypes of males and females in the biological thinking around the process of reproduction. She asserts, "it is remarkable how "femininely" the egg behaves and how "masculinely" the sperm" (Martin, 1990, p. 489). The egg is passive; it does not move on its own, but "is swept" or "transported". Sperms, in contrast, are active, move fast, and "activate the developmental program of the egg". Martin adds that processes in

the female reproductive system are almost invariably cast in a negative light. Menstruation is the "debris" of the uterine lining, a failure, a lost opportunity; once-a-month production of an egg which escapes fertilization is utterly wasteful. The male reproductive processes are evaluated differently as the generation of millions of sperms daily is lauded, with no concerns of economy, and the mechanism of producing sperms is considered awe-inspiring and wonderful. As a result, the message that gets conveyed is that not only are female bodily processes less worthy than male bodily processes, but by extension, women are less worthy than men (Martin, 1990).

Keller (1995) provides another example of a metaphor with gendered connotations that had a significant impact on the field of molecular biology. She reports that the metaphor of gene-organism or gene action was devised to capture the elusive concept of gene in the early 20th century—gene as both a physicist's atom and as an architect's plan. This linguistic move opened up a prolific research program, which not only worked without an actual and firm knowledge of its central concept, but it also determined which questions could be asked and thus what kind of explanations made sense. While studying the organisms, the male gamete (the sperm) was readily fashioned as "pure nucleus", while the female egg, because of its much bigger size, was considered as a combination of nucleus and cytoplasm. These apparently coherent cultural-conceptual linkages between nucleus, sperm, and male on the one hand, and between cytoplasm, egg and female on the other hand had the cumulative effect of channelling more scientific attention and resources to the study of "spermy" nucleus, and of suppressing the study of the rest of the cell or even rest of the organism.

Science as Rhetoric

Metaphors of gender politics have been consistently present in both informal and formal thinking of scientists since the emergence of modern science. In fact, the earliest formulations of modern philosophy of science were conceived and expressed by employing sexist language and metaphors:

For you have to but follow and as it were hound nature in her wanderings, and you will be able when you like to lead and drive her afterward to the same place again....

Neither ought a man to make scruple of entering and penetrating into those holes and corners when the inquisition of truth is his whole object. (Francis Bacon, as cited in Harding, 1986)

Metaphors in science are not discardable heuristic tools which lead to a more literal description and explanation of a phenomenon under investigation (Hesse, as cited in Harding, 1986). They link two systems which interact with each other in a way that "men are seen to be more like wolves after the wolf metaphor is used, and wolves seem to be more human" (as cited in Harding, 1986). Hence, the writings of Bacon and his successors helped equate woman and nature, implying that nature could be harangued like women, and exploitation and harassment of women was "natural".

Another manner in which scientific rhetoric incorporates gender ideologies is by maintaining and perpetuating the value of the meta category of "laws of nature" to codify observed regularities in the natural world. A presumed transparency and neutrality of scientific language renders "laws of nature" beyond the relativity of language and, in the same move, obscures

the political and theological origins of the idea of the phrase. Like laws of state, they are historically imposed from above and obeyed from below.

Keller (1985) shows that this impulse to produce knowledge aimed at controlling and predicting nature by using the laws of nature, co-develops with aggression and autonomy in the male psyche in western familial structures. She argues that the traditional form of objectivity, as characterized by a separation between the knowing subject and the object to be known is a masculine phenomenon. Female psychological development does not proceed through a complete separation between the subject and the object, which Keller argues, provides us with a wider, non-hierarchical category of "order" to capture the regularities in nature.

An analysis of the metaphor of science as a "mirror of nature" also leads us to challenge the rhetoric of science as an objective, value-neutral body of knowledge. In this conception, knowledge generation is a function of "vision", of sighting a separate non-self, a trait associated with the infamous "male gaze" This sighting of a separate non-self is predicated upon the passivity of the object observed and the active observer, lending itself to be categorised as male gaze. As Keller and Grontkowski (1996) write, "[V]ision is that sense which places the world at greatest remove; it is also that sense which is capable of functioning outside of time ... it is the sense which most readily promotes the illusion of disengagement and objectification" (p. 191).

Conclusion

Feminists have successfully shown the presence of male bias in science. Contemporary feminist theories of science aim to rescue science from its

misgivings about nature, knowledge, knower and method. Needless to say, such a framework and philosophy would have to be conceptualized using feminist metaphors. The aim of knowledge would therefore not be domination and mastery, but reciprocal understanding and appreciation of nature. Establishing mechanisms to check which values become a part of science would therefore be necessary. Objectivity would no longer be characterized in terms of distance, absolutism and disinterestedness, but in terms of close contact, responsibility and partiality, along with a heightened

concern for those on the margins of science and society.

Though it may be difficult to imagine the exact form of "feminist" science right now, we need not wait for it to be historically realized to experience the force of these ideas. For us, as actors in the field of education, a reflection on these issues is warranted not just to examine our own knowledge and beliefs but also to acknowledge our collusion in maintaining and even strengthening status quo through our pedagogies. Such a reflection or "waking up", to use another metaphor, is both necessary and timely.

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