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Science and language, knowledge and power

Significance:

All scientific knowledge is encoded in socially constructed forms of communication with language being the primary mode. When language is understood as a socio-cultural practice and a resource for meaning-making, it has significant implications for how we understand knowledge-building in disciplines and the inherent power relationships that are created in the way we use language to construct different kinds of knowledge and position knowledge in the field. It also has implications for how we share and validate knowledge with and to others. If science is to be used for social justice, understanding science communication necessitates considerations of language, knowledge and power.

Introduction

The Academy of Science of South Africa (ASSAf) invited us to be part of a panel in the World Science Forum (December 2022) addressing the topic 'Promoting social justice through accessibility of language in science'. This panel discussion was hosted by the *South African Journal of Science* (SAJS). The issue of language and scientific knowledge is not new to the journal, the impact of which is noted in their inclusive language policy that authors need to adhere to when disseminating their research. It is against this backdrop that we offer this Commentary to further the conversation about how language, knowledge, power, and social justice intersect and shape each other.

It is crucial that critical scholars in the arts, social and natural sciences pause to consider what role science broadly should play in social justice. For many scholars in the arts and social sciences, especially those who focus on the many evolving complexities of everyday life, politics, and economics, the pure and natural sciences may seem distant and inaccessible. In the same breath, the multiple and competing ontological and epistemological positionings (questions around what is real and how we come to know it) in the humanities and social sciences is often regarded as being incompatible with those working in the natural sciences. Yet, as the many storms of the Capitalocene[1] gather strength and intensity, playing out in multiple forms of human suffering, it is more crucial than ever that we seek ways to connect the findings of different kinds of scientific research with the project of social justice.

Given the dominance of the written text for disseminating scientific knowledge, questions around language are important to consider, irrespective of one's discipline. As Maton explains, however, ideas around the sociality of knowledge have been the site of contestation as many views offered misrepresent knowledge as "processes of knowing within the minds of the knower"[2]. Drawing on Alexander[3], he goes on to explain that this contributes to an "epistemological dilemma" whereby scholars are offered two polarising perspectives on which to draw: positivist absolutism (where knowledge becomes decontextualised, value-free, detached and certain) or constructivist relativism (where knowledge is seen to be only a social construct produced within cultural and historical conditions).[2] Writing from a social realist perspective that draws on the philosophy of Bhaskar's critical realism, we posit that the knowledge produced by science and its objects are real; however, social factors contribute to, and shape, its production. This position allows us to open up a conversation about language as a social practice and the implications this has on knowledge creation and dissemination without compromising the view that knowledge has intrinsic features which are real.

When adopting this view, it makes visible the responsibility of scientists to consider not only how they 'transmit' their knowledge and findings to the public, but also to be aware of how their ontological position impacts on the kind of knowledge they legitimate in these spaces and the inherent power dynamics that are created therein. Science itself cannot exist without some form of articulation of what is being found, how, why and what it means. When scientists see 'science communication' as an add-on or afterthought to the core work of whatever it is that they are researching, they are failing to acknowledge the social practices through which scientific knowledge is constructed and disseminated and the role language plays in this regard.

Science and language

Drawing on Systemic Functional Linguistics (SFL)[4], Francis Christie's[5] work provides a useful distinction between language as a 'vehicle' for conveying pre-constructed thought and language as a *resource* for meaning making. SFL scholars argue that we make sense of, and construct understandings about our social and natural world through language. We also use language to transmit this meaning across contexts. If language is understood in this way it becomes possible to see how scientific knowledge, constructed through social discursive practices such as language, becomes laden with 'norms' and values of a discipline. Language becomes the signifier of what counts in a discipline – for example, the use of first person versus passive objectivity. In other words, the language we use is not arbitrary. It is determined by the disciplinary context in which we work and the value system that shapes that context. When we start to interrogate these discursive choices we can begin to appreciate that no scientific knowledge is neutral and that language plays a role in embedding power within knowledge practices.

Language and knowledge

A number of critical social theories posit the political nature of knowledge and the power imbued in knowledge practices. For example, a Foucauldian approach to science requires a consideration of the relation between data, methodology and the exercise of authority. In short, studying how science is communicated requires us to consider the place of evidence in regimes of power.[6] Scientists should be encouraged to consider what forms of address,

relations of power, and values in relation to evidence are normative within their disciplines and fields, and how those in turn might show up in how they communicate the content and broader significance of their work. This critical reflexive work, although perhaps alien to many non-social scientists, can allow normative modes of knowledge-making to be questioned and deconstructed in ways that are supportive and constitutive of the collective project of creating a more just society.

A theory such as Legitimation Code Theory (LCT)[2] provides analytical tools for doing such critical reflexive work. Adopting a social realist perspective we offered at the beginning of this paper, LCT acknowledges the rational objectivity that knowledge does exist while at the same time recognising knowledge as a social phenomenon that is fallible rather than absolute or relative.[7] In this sense, it provides a realist way of thinking while at the same time maintaining the social character of knowledge. The framework offers multiple dimensions, each exploring one set of organising principles of dispositions, practices and fields. For example, the dimension of Specialisation explores practices in terms of knowledge-knower structures whose organising principles comprise relative strengths of *epistemic relations* and *social relations*. Epistemic relations relate to specialised knowledge, principles or procedures concerning specific objects of study. Social relations relate to the attributes of the actors involved in the knowledge production (such as race or gender, particular dispositions and/or identities).[2] While all knowledge practices necessarily have both sets of relations present at all times, by analytically separating these two sets of relations one can ask explicit questions of 'what' can be described as knowledge and 'who' can be a legitimate knower in any given field. Doing so reveals how different disciplines place emphasis on different relations. In other words, it is able to reveal the extent to which disciplines emphasise or value specialist skills or technical procedures for working with and constructing knowledge as opposed to highlighting significant authors or knowers in the field, specific perspectives, or particular kinds of dispositions (e.g. critical thinking).

To illustrate the implications of these different qualities on knowledge-building and knowledge dissemination, consider a crude comparison between the natural sciences and the humanities. Generally speaking, the natural sciences tend to foreground specific objects of knowledge and specialist procedures. For example, the use of the scientific method and the often structured manner of building claims is a technical process that scholars need to be highly trained to enact. Because of these explicit ways of working with and constructing knowledge there is often broad agreement in the disciplines about what counts as legitimate objects of knowledge and legitimate ways of working with that knowledge (the procedures involved). In Bernsteinian terms, this could be described as a "hierarchical knowledge structure"[8] as disciplines have some shared understandings of basic principles and premises on which individual disciplines are then built.

On the other end of the spectrum, if we consider the humanities, the emphasis is typically placed on cultivating particular ways of knowing and ways of interacting with knowledge rather than on specialist objects and technical procedures. For example, the emphasis is often on arguing for different viewpoints, engaging with particular authors in the field, aligning oneself with the work of particular scholars and distancing oneself from others. In such disciplines, the boundaries of what counts as legitimate knowledge and ways of coming to know that knowledge are much more fluid than that in the natural sciences. In Bernsteinian terms, this would represent a "horizontal knowledge structure"[8], where multiple theories, perspectives, value systems and knowledges compete for legitimacy alongside each other.

What is interesting to note in this broad comparison is that the natural sciences are not devoid of subjective aspects of knowledge-building (i.e. there are still 'knowers' involved) and the humanities are not devoid of specialist knowledge or procedures. Rather, both of these aspects are present but the language choices that are made when constructing the knowledge emphasise one set of relations over the other. For example, because the natural sciences espouse a shared understanding of principles of knowledge that rest on objectivity, subjective values and dispositions involved are typically downplayed or hidden from view. In

this sense, the outputs of the scientist are commonly valued more highly than who the scientist is. This is one of the reasons why writing in the first person would be inappropriate in a natural science discipline – the focus is on the knowledge and the procedures, not the person.

Knowledge and power

Critical reflexive work on how disciplinary knowledge is shaped by language is also important as it highlights the role of the *context* of knowledge-building: context determines what is appropriate and when. Returning to the comparison above, in the natural sciences where principles of accuracy, reproducibility, cross-cultural communication and validity are important, it would make sense, for example, to use very dense scientific names for objects and procedures. In this context, dense symbols and formulas may be necessary in order to communicate across social groups in ways that uphold the principles of knowledge. In the humanities, if the argument is the central function, where persuasion is key in order to convince a reader about a particular ideological position over another, then lexical choice and particular ways of building claims becomes imperative when considering language. Language, therefore, is not arbitrary: it is bound by and shaped by, and in turn shapes, disciplines and disciplinary knowledge.

What is interesting to note, however, is that when language is used to construct knowledge in particular ways, social power within the knowledge can be more or less visible. For example, scholars have argued that there is, at times, evidence of what Maton refers to as 'knower blindness' in the natural sciences (in contrast to 'knowledge blindness' that often results from constructivist relativism in the humanities and social sciences).[2] Blackie and Adendorff[9] have taken up this concept to describe how, in scientific research, the sociality of knowledge (such as the diversity the knower brings to the process of knowledge-building) is concealed from view. The authors argue that "[k]nower-blindness is not just an accident of the system, it is actively endorsed"[9]. This is because knower acknowledgement can, at times, threaten the principles for building 'objective' knowledge in particular disciplines. Yet as Blackie[10] argues, it is the social practice of science – that is, the act of practising scientists testing and refining theory – that enables disciplines to develop and grow in accuracy over time. A consequence of this interaction, however, is that social power shapes the development of science and the cultures in which the science occurs.[11]

Understanding that all forms of knowledge have social power, and how language plays a role in establishing and maintaining such power in societies, is important if we are to bring different kinds of knowledges (and scholars) together to solve wicked problems for social justice means. It also has implications for how we teach this knowledge to newcomers in the field. Again, drawing on LCT, this time incorporating the dimension of Semantics that considers how context dependent and complex knowledge is, scholars such as Ellery[12], Mouton and Archer[13] and Conana et al.[14] are doing important work on how access to knowledge practices and associated 'ways of being' are facilitated in higher education spaces. Such work problematises the notion that higher education is a meritocracy, and shows that some forms of knowledge, ways of knowing, and educational practices tend to 'match' the dispositions of some newcomers more so than others. They also draw attention to how curriculum design and pedagogy needs to be responsive to, and make explicit, not only the kinds of knowledge that are legitimated in different spaces, but also the associated literacy practices, dispositions and value systems that accompany different disciplinary areas. Without such awareness, the way in which access to disciplinary knowledge is facilitated has the power to include and exclude potential knowers.

The relationship between language, knowledge and power also has real implications for the way we communicate science, particularly across disciplinary contexts and into the public sphere. Our argument that scientific knowledge has both real and social qualities offers an invitation for researchers to reflect on the following questions: for whom does science work for or against, and with what purpose? When are scientists listened to or ignored, and why? Which scientists are taken seriously and by whom, and why? What forms of evidence are taken seriously by those in power, and which are not, and why? Which kinds of scientific evidence are amplified or silenced, and by which actors, in which contexts?

If science is to be used for social justice means, researchers need to be aware of the power imbued in their particular forms of knowledge and the impact this has on the sharing of ideas and working together to solve problems in our societies.

Conclusion

When pausing to consider the importance of developing inclusivity in the broader project of science, knowledge dissemination is key. It is also important to remember that both communication and science have been, and can be, exercised as instruments of power (and indeed, resistance). Scientific communication, just like science, is not neutral, and is shaped by political economies of influence, bias, and unequal distributions of resources.[15] Just as all knowledge creation is an inherently complex social process, so too is communication always multidirectional, networked and not linear. Working for inclusivity and participation in relation to science creation and dissemination therefore requires interactive and dialogic modes of exchange: various forms of citizen science, listening as well as telling, and democratic and decolonial perspectives on what counts as knowledge.

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Competing interests

We have no competing interests to declare.

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