

Epistemological Deviant, Epistemic Abjection and Lost Opportunities: A Case Study of a Muslim Trans Intersex Student's Othering and Dehumanisation in an Indian Science Classroom

Contemporary Education Dialogue
1–22

© 2023 Education Dialogue Trust
Article reuse guidelines:
in.sagepub.com/journals-permissions-india
DOI: [10.1177/09731849231206226](https://doi.org/10.1177/09731849231206226)
journals.sagepub.com/home/ced



Sayantana Datta¹ 

Abstract

This article sheds light on the registers of violence through which people from marginalised groups—especially non-normative or minoritised collectivities of gender, sex and religion—are constructed as outsiders in science higher education in India. Further, this article delineates the production and construction of a ‘normal’ sex/gender in a science classroom as distinct from a ‘biological’ sex/gender. Towards these goals, this article uses autobiographical narratives of a Muslim intersex transgender (trans) individual pursuing their masters in a science institution in Bengaluru, India, which it analyses using sociology of science and psychoanalytic lenses to articulate these mechanisms as the construction of the ‘epistemological deviant’ and the employment of ‘epistemic abjection’.

¹Centre for Writing and Pedagogy, Krea University, Sri City, Andhra Pradesh, India

Corresponding author:

Sayantana Datta, Centre for Writing and Pedagogy, Krea University, Sri City, Andhra Pradesh 517646, India.

E-mail: [sayantan.datta@krea.edu.in](mailto:sayantana.datta@krea.edu.in)

Keywords

Science education, transgender studies, intersex studies, science and religion

Introduction

Evidence continues to mount on persistent inequalities in Indian science institutions. As of 2023, women account for a mere 13.5% of all faculties in the country's science institutions (BiasWatchIndia, 2022). Dalit and Adivasi communities are abysmally represented in the Indian science ecosystem, and their numbers continue to reduce as one moves from undergraduate to higher levels (Paliwal, 2023). Further, increasing suicides of students from marginalised castes in the country's elite science institutions indicate an atmosphere of hostility against such students (Moizee, 2023). Prior studies have indicated that the participation of marginalised gender and caste groups in the Indian science ecosystem is contingent on structural factors rather than individual competence (Chunawala & Ladage, 1998; Chunawala, et al. 2009; Godbole & Ramaswamy, 2015; Kaur, 2015; Kurup et al., 2010; Subramanian, 2019; Thomas, 2020). In other words, it is being increasingly recognised that science institutions in India operate within, and reproduce, the social and political structures of caste patriarchy.

While the concerns of (cisgender) women, and marginalised castes and tribes have been relatively placed in contemporary science studies and science education critiques, trans and intersex individuals remain unaddressed demographic groups. In 2014, the Supreme Court of India delivered a landmark judgement that granted trans persons the right to self-identify their gender and equal opportunities in education and employment (National Legal Services Authority v. Union of India, 2014). Soon after this judgement, the University Grants Commission (2014, 2015a, 2015b, 2016), through several circulars, made clear its stand of making higher education accessible to trans persons. Similar sentiments are visible in the Transgender Persons (Protection of Rights) Act (2019), the Ministry of Human Resources and Development (2020) and the draft Science, Technology and Innovation Policy (Datta et al., 2022; Ministry of Science and Technology, 2020). Despite these judicial and legislative interventions, trans persons continue to remain underrepresented in the Indian science ecosystem (Datta, 2023a).

Like in the case of cisgender women and individuals from marginalised castes, the exclusion of trans individuals has been located in systemic and epistemic prejudice in the Indian science ecosystem. A 2020 report that surveyed self-identified trans, gender non-conforming (GNC) and gender non-binary (GNB) individuals ($n = 15$) in the science higher education in India found that their mobility in and accessibility of institutional spaces is severely restricted due to the segregation of institutional spaces per binary gender norms, that they routinely face harassment and abuse of both sexual and non-sexual nature, and that their mental health is affected as a result of these exclusionary tendencies (Datta, 2020). This report also draws attention to the lack of affirmative action and anti-discrimination policies targeted specifically towards trans, GNC and GNB individuals. Another 2021 survey-based study ($n = 47$) found that individuals who are lesbian, gay, bisexual, trans, intersex, asexual or belong to other non-normative genders and sexualities (LGBTQIA+) tend to face a mental health crisis owing to continued bullying and harassment, and fear of impending ostracisation (Datta, 2021). Notably, this report also identifies ‘the silence of gender and sexuality in *STEM* [*science, technology, engineering and medicine*] spaces’ and a ‘STEM syllabus that is discriminatory against queer-trans people’ as key contributors to the impending mental health crisis that trans, GNC and GNB individuals in the Indian science ecosystem face. Further, Bittu Karthik Kondaiah (aka Bittu K. Rajaraman), a genderqueer trans man and a neuroscientist, wrote in a 2017 autobiographical note that they are ‘mostly seen by scientists as a masculine woman and [their] trans identity is erased. And, [they] feel this is sometimes academically rewarded (if socially disparaged) because it is misunderstood as an acceptance of the equation between masculinity and scientific ability’ (Kondaiah et al., 2017). Thus, Kondaiah et al. demonstrate the lack of a lens that allows practitioners of science to *see* transness; in other words, along with epistemic prejudice, trans individuals face hermeneutic injustice (Jain & Rhoten, 2020) in these institutions where they are compelled to conform to what the institution of science and its practitioners can imagine or discern them to be. Finally, it has also been argued that science education often follows strict deductive principles and problematises marginalised communities (Haverkamp et al., 2021; Kersey & Voigt, 2021). Thus, the marginalisation of trans, GNC and GNB individuals in science higher education can be argued to occur through four distinct mechanisms: that of the nature and culture of science, that of infrastructural segregation across binary gender norms,

through dated and discriminatory curricula and textbooks, and finally, through the lack of affirmative-action and anti-discrimination policies.

Unfortunately, making similar observations about intersex persons in the Indian science ecosystem is difficult due to the lack of literature. In fact, the *National Legal Services Authority v. Union of India* (2014) judgement, regarded as a landmark victory for trans persons, has been criticised for having only perfunctorily engaged with the concerns of intersex persons. As Banerjee and Rajam write, ‘The NALSA judgement omits the primary concern of the intersex community, which is the pathologisation of their bodies in childhood. In fact, apart from referring to legal protections offered to intersex persons in other countries, it doesn’t engage with the intersex question’ (2022). Thus, the collapsing of the intersex identity into the trans identity by the *NALSA v. UoI* judgement leads to an act of hermeneutic injustice (Jain & Rhoten, 2020) where, to seek the same civil and substantive rights as trans individuals, intersex people must begin identifying as trans. Despite the concerns of intersex individuals in the Indian science ecosystem being an open question, there is a body of global literature that demonstrates the pathologising gaze of science and medicine on the bodies and identities of intersex individuals (Jones, 2018; Jones & Jacombs, 2021). Further, a recent paper that looks at curriculum in New Zealand mentions that ‘Intersex people have been restricted in the inclusion and predominantly are invisible in the curriculum overall’ (Sterling, 2023).

Research on the relationship between science and religion in India has had a slightly different trajectory. Rather than investigating the access of different religious groups to the Indian science ecosystem, the key focus for anthropologists has been to investigate the religious lives of scientists (Thomas, 2021). Despite the significant contribution of such studies in unravelling the complex relationship between science and religion in India, narratives of people who belong to minoritised or marginalised religious collectivities and are a part of the Indian science ecosystem are missing.

Thus, there continues to be a lack of voices from non-normative genders and sexualities, and minoritised and marginalised religions in the science studies and science education landscape. Further, a thorough qualitative investigation of how people from these marginalised backgrounds negotiate and navigate science institutions and the institution of science is missing. More importantly, most of the studies mentioned above have not taken an intersectional approach, thus making it difficult to determine how different axes of marginalisation might complicate the registers of negotiation and navigation that people from

minoritised or marginalised backgrounds employ in the Indian science ecosystem.

To fill these gaps, this article reports vignettes of autobiographical narratives of D, a science student (at the time of my fieldwork) who is trans, intersex and Muslim. From these vignettes, I identify mechanisms of exclusion and epistemic violence against sex-, gender- and religion-marginalised people in Indian science institutions. My interest in identifying these mechanisms is to add to the growing body of work documenting different experiences of marginalised groups in the Indian science ecosystem, while simultaneously charting ways to undo these violent desires and exclusionary tendencies. Through my analyses of D's narratives, I locate these exclusionary tendencies in two conceptual frameworks that I call 'epistemological deviant' and 'epistemic abjection'. I also shed light on the opportunities of transformative science that education missed as a result of these tendencies.

Methodology

This article emerges from a larger qualitative study¹ employing semi-structured interviews to document the lived experiences of trans, GNC and GNB persons in the Indian science ecosystem. For the larger study, participants were identified and recruited via purposive sampling (Robinson, 2014) through informal collectives of trans, GNC and GNB individuals, of which the author is a part. Additional participants were recruited through snowball sampling (Morgan, 2008). Given that this research intended to identify phenomena specific to trans, GNC and GNB people in the Indian science ecosystem, the study had an 'idiographic' aim (Robinson, 2014).² Therefore, the study worked with a sample size of 10 participants.

The participants were located in three different urban metropolitan centres with a high concentration of respected science research and higher education institutions in India: Mumbai, Bengaluru and Hyderabad. Seven participants were graduate students (MSc or PhD.), two participants were undergraduate students and one participant was a tenured faculty in a science education institution. Each interview was conducted and recorded under informed consent for around 2–3 hours in-person; the recordings were transcribed, anonymised and de-identified. The transcripts were then analysed thematically to identify individual instances of negotiation and navigation through the four registers mentioned above (nature and culture of science, infrastructure,

curriculum and pedagogy, and the [lack of] affirmative action and anti-discrimination policies).³

Through the interviews, I sought to document the lived experiences of my research participants in order to generate autobiographical narratives about their experiences in the Indian science ecosystem. This is because autobiographical narratives of trans, GNC and GNB people are underrepresented in the Indian science ecosystem.⁴ Further, as has been argued previously by Chadha and Achuthan (2017), autobiographical narratives offer ‘an account of...enmeshed experience of inclusion alongside marginalisation or discrimination’. Since this study intended to investigate violent desires, exclusionary tendencies and transformative potentials in Indian science higher education institutions, it was important to document the ‘enmeshed experience’ of the research participants. Finally, generating and documenting these autobiographical narratives allowed me to comment on not just the lived experiences of the research participants, but also systemic and epistemic machineries of the institutions they were located in.

Among the 10 interviewees, the narratives from D stood out. At the time of my fieldwork, D was pursuing a Master of Science degree in a well-respected science institution in Bengaluru. Given that D is Muslim, intersex and trans, their autobiographical narratives provided me with a unique opportunity to document how sex, gender and religion might collectively contribute to shaping one’s experience in science education.

Positionality Statement

Using philosopher Sandra Harding’s standpoint theory (1987) as a stepping stone, engineering education researchers Hampton et al. argue that ‘researcher positionality is an act of making the invisible decisions and interpretations of the researcher visible in the study’ (2021). Accordingly, here I will use a brief autobiographical note to lay out my lived experiences that inform my interpretative frameworks and my assumptions in the study.

While academically trained in the natural sciences, I am a science journalist who writes at the intersections of science, gender, sexuality, health and caste. Currently, I am a faculty member at the writing and pedagogy centre of a private liberal arts university in South India. I come from a Hindu family with two generations of inter-caste marriages, although I grew up in an environment perhaps not very different from those of the ‘upper-caste households’ despite my natal family being

relatively on the lower end of the ‘middle-class’ spectrum. I am the first person in my (extended) family to finish an MSc degree.

I settled on the label ‘queer-trans’ during my MSc because I believed it allowed me to synthesise my gender and sexuality more comprehensively than any of the labels I had previously used. During my PhD., I faced different macro- and micro-aggressions at my workplace, an elite science research institution, presumably due to my gender and sexual orientation, and despite my caste privilege shielding me from other forms of abuse and harassment, including the questioning of my ‘merit’ (which is a routine phenomenon for people from marginalised caste backgrounds). Simultaneously, my participation in feminist, queer and trans circles informed my understanding of science. Alongside, the suicide of Rohith Vemula at the University of Hyderabad (Hegde, 2016) had a deep impact on my relationship with science and revealed the ways in which caste undergirds how learners, educators and practitioners interact with the Indian science ecosystem. As a result, I left my PhD in 2021 to pursue science journalism full-time, continuing to investigate and write about the ways in which gender, sexuality and caste shape science and health practice and research.

Queer feminist, anti-caste, postmodernist and decolonial thought shape my views of science, science practice and science education. As a result, I have come to believe that science and science practice are reflective of—and often bolster—structural inequalities in society. Further, I am suspicious of strict deductive principles and strict categorisation, most of which in science are binaries. Finally, I am also interested in privileging marginalised standpoints (Harding, 1992) in the Indian science ecosystem. The goal of my work, as I see it, is to eventually reveal transformative potentials in science and science education.

I have come to recognise that I am located in the ‘liminal space’ (Datta & Kumar, 2023) between science and social science, which I have come to see as a part of my queer existence. If being queer is indeed about, as Bell Hooks says, ‘the self that is at odds with everything around it and has to invent and create and find a place to speak and to thrive and to live’ (Hooks, 2014), then this liminal existence allows me to be at ‘odds’ with both science and social science, while simultaneously co-existing in both, therefore allowing me to critique the binary classification of ‘science’ *versus* ‘social science’. Thus, my queerness transcends immediate concerns of gender and sexuality, and informs my views of and experiences with epistemic frameworks.

‘Do We Take a Muslim into Our Space?’: Threat to the Nation as the Threat to Science

I met D in Bengaluru after the ‘third wave’ of the COVID-19 pandemic had subsided considerably. That is why I couldn’t help chuckling when D asked me to meet them at a cafe called *Third Wave Coffee*. D is a Muslim, intersex and trans person, and was born and brought up in the Middle East. They came to Bengaluru when they took admission in an Engineering college, which they quit because they couldn’t take the ‘trauma’, they told me. Eventually, they joined a well-established and reputed science college, and their training is in molecular genetics and cellular biology. In 2021, with their undergraduate degree complete, they began applying for their Master’s degree. ‘There was this weird fear of my college application[s] being rejected because of my name, my religion, and the caste I belong to,’ they told me during our conversation. Their fears came true when one of the institutions they had applied to told them to discontinue their application owing to ‘communal tensions’ in the city that the said institution was located in. They suggested that D look at options in Bengaluru. When I asked D whether communal tensions were underway in Bengaluru, they said, ‘[they are], but certainly not in our college, which is very surprising...because it’s a pro-BJP [Bharatiya Janata Party] and pro-RSS [Rashtriya Swayamsevak Sangh] college’. Further, they added that the institution does not have a uniform yet and that there are students who wear hijab in their class.

Yet, D has not escaped what they call ‘blatant’ Islamophobia. For instance, they recount appearing for an interview for a research position where the interviewer—a faculty—asked them, pointing at their Muslim identity: ‘You’re not going to give this research to any country and utilise that against *us*, are you?’ (Emphasis mine). D was taken aback but not surprised, they told me. The concern of the faculty, according to D, was, ‘Do we take a Muslim into our space and let this person be a researcher or a project assistant?’

D’s experience challenges a long-standing assumption of modernity: that science leads to secularisation (Harrison, 2017). Despite arguments posited in favour of this assumption—for example, that modern science is intrinsically secular in so that its history demonstrates the ‘breaching’ of cultural and religious barriers (Jayaraman, 1997), religious lives of scientists, at least in the context of India, tell a different truth (Thomas, 2021). As the vignette above demonstrates, researchers in science institutions are not only prone to upholding communal and religious

beliefs but also deploy them in order to exclude people from minoritised religions and preserve nationalistic narratives. In the said faculty's concern above, one must observe how the participation of a marginalised individual in the process of scientific knowledge production is perceived as a threat to not just the epistemological project but also portrayed as a threat to the nation. In *Fear of Small Numbers* (2006), anthropologist Arjun Appadurai argues that 'Muslims in India have always been subject to the charge of being more loyal to the wider Muslim world than to India' (p. 69), and thus, a threat to the safety of the Indian nation, which is often constructed as a '*Hindu Rashtra*' (Hindu Nation). In the case of D's narrative, what is notable is that the desire to participate in scientific knowledge production becomes crucial to the construction of the putative Muslim scientist as a threat. In other words, the Muslim scientist is not just outside of the 'us' collectivity that the interviewer constructs, but also a threat to this collectivity by virtue of their perceived loyalty to what Appadurai calls the 'wider muslim world'. Further, unlike people from marginalised genders and castes, whose participation in the project of scientific knowledge making is hampered by the construct of 'merit' (Subramanian, 2019), in the case of D, their participation is questioned by invoking the question of (dis)loyalty to the nation. This demonstrates how the participation of marginalised individuals in the epistemological project of scientific knowledge production is inextricably linked to their ontological construction in the communal nation-state by metonymically associating a perceived threat to a 'nation' with a perceived threat to the relationship between science and nation. The contours of this relationship are clear: for science to not become a weapon *against* the state, it must be performed by those whom the state trusts.

We also see how the exclusion of the constructed other is not just an attempt to keep the epistemological project sacrosanct but also the political project of determining who gets to participate in this epistemological project. This is not very different from the Vedic Brahminical tendencies, where knowledge was seen as a way of consolidating the power of the Brahmins over other castes and, thus, the project of knowledge production was kept limited to the Brahmins (Kondaiah et al., 2017). This epistemic violence, therefore, is not just communal violence but also caste violence.

‘What You Are Talking About is Called Sociology’: The Epistemological Deviant

In the previous section, I have demonstrated the links between the epistemological project of scientific research and how the participation of individuals in this project is shaped through the construction of homogenous communal and national identities. In doing so, dominant groups appear to construct marginalised individuals as a ‘threat’, thus consolidating their power over the epistemological project of scientific knowledge production. In this section, I build upon the relationship between science and power to demonstrate how scientific knowledge serves authoritarian tendencies, and how the social sciences are constructed as an ‘epistemological deviant’ to the grand narratives of science.

When D was pursuing a BSc degree, they went to their college principal to request a queer cell on campus; they went not as a queer person but as an ‘ally’.⁵ The principal, in shock, asked them, ‘queer students exist in our college? Do they actually come to college to study?’ The principal’s shock is demonstrative of how queer and trans individuals are seen as absent from and incapable of pursuing science higher education in India. More importantly, when conversations around queer and trans individuals are breached in these institutions, it is not just their existence but their intentions of coming to higher education that are under scrutiny. Queer and trans people are seen as infiltrating the campus, and not for purposes of pursuing education.

Often, this disbelief transcends the domain of ‘belief’ altogether and is constructed as a fact; the silence of trans students is read as their absence. For example, in a later conversation, D’s principal *told* them that ‘there are no such students.’ Further, the principal asked D, almost rhetorically, ‘who will make sure that nothing anti-college and anti-government is happening through this forum?’ Here, one can observe how the principal’s comment contradicts the grand narrative of the enlightenment, within which modern science is firmly rooted. As William Bristow points out, the age of the enlightenment (sixteenth and seventeenth century) is marked by a confidence on humanity’s intellectual power to make systematic inquiries about nature and offer an ‘authoritative guide’ to practical life; this confidence, Bristow notes, is coupled with a ‘suspicion or hostility’ towards other forms or carriers of authority (such as tradition, superstition, prejudice, myth and miracles; Bristow, 2017). In that sense, the project of enlightenment—and by

extension, of modern science—is to displace authoritative tendencies and replace the same with an authority of ‘reason’ (Kant, 1787). This critique of authority has been posited to be one of the key purposes of science education (Desiraju, 2008). In a searing critique of postmodern and postcolonial thought, historian of science Meera Nanda locates into modern science the power to counter grand narratives of the Hindu Right (Nanda, 2005). Yet, as we observe in the principal’s comment in the vignette above, what becomes explicit is that the task of science education is no longer in the service of countering authority but in preserving it.

Perhaps one must also deliberate on what I refer to as ‘authority’ here. To be clear, in this context, I am using ‘authority’ to refer to the normative ways of seeing and understanding the world. Another example of this normative way would be the binary construction of gender through which modern biology approaches knowledge production. This perspective is reproduced in science classrooms, where information is articulated through categories of ‘male/female’ or ‘man/woman’ and classrooms are segregated into spaces for ‘boys’ and ‘girls’ much like the infrastructures of the rest of the institution (Datta, 2020). The belief that ‘biological sex’ is a binary continues to pervade the understanding of biologists, as demonstrated by a biology professor’s severe criticism of an opposing stance by the Supreme Court of India during the ongoing marriage equality hearings (Datta, 2023b). This is despite a body of literature within biology that demonstrates the complex and non-binary nature of biological sex (for a brilliant review, see Fausto-Sterling, 2012).

In a research methodology class, D attempted confronting a teacher who taught that ‘there are only two genders.’ Below is a snippet of the conversation as D reconstructed it for me.

D: No ma’am, when you say ‘two genders’, that is erasure. There are other identities out there.

Teacher: No, *according to me*, there are only two genders; anything else is a deviant. What you are talking about is called sociology, and life sciences does not accommodate parameters like gender and sexuality. (Emphasis mine)

Here, it is important to note how the teacher employs belief (‘according to me’) to defend the gender binary in a classroom where practitioners are expected to learn the key tenets of modern science. As Bilimoria and Stewart (2009), and Kersey and Voigt (2021), note, practitioners of

science are expected to embody views that are ‘in sync’ with the scientific method (e.g., objectivity, rationalism, positivism, etc.) and are detached from personal identities, experience and beliefs. Yet, the reality of Indian science classrooms, seen from the eyes and experiences of trans individuals, demonstrates that subjective beliefs are employed as and when required to cement the authority of normative assumptions. Similar observations of scientists adhering to normative assumptions—many of which cement and reproduce the authority of dominant groups—have been made by scholars from various disciplines in the past (Panchapakesan, 2017; Subramanian, 2007, 2017, 2019; Thomas, 2020).

It is also critical to ask why the teacher specifically refers to sociology when referring to the contradiction that there are more than two genders. It is true that sociology as a discipline has been deeply concerned with the study of gender. More importantly, at least in the context of India, the ‘social sciences’—perhaps what the teacher is referring to while using the term ‘sociology’—has been seen to be in a perpetual conflict with the ‘sciences’. In fact, this distinction between the social sciences and the sciences—or, more accurately, the epistemologies of the two—is also hegemonic. Signs of this hegemony are visible early; for instance, school students who score relatively higher are expected to take up sciences, and students who take up the humanities and the social sciences are seen as less intelligent (Rishikesh, 2008). Further, this epistemic hegemony has been posited to also be gendered in several ways: Rishikesh has argued that more women are expected to take up social sciences than men since ‘social science subjects are considered as non-premium fields, in terms of importance, demand, and hence the fee, and patriarchal societies such as ours carry the belief that girls need not study anything worthwhile.’ Similarly, the social sciences are seen as ‘soft’ disciplines, that is, ‘intellectually easier’ or ‘less rigorous’ (Sarangapani, 2011).⁵ Finally, as the debates around the 2017 ‘March for Science’ in India lay bare, sciences continue to be seen as the only legitimate way of making sense of the world, and social scientific critiques of science are seen as hindrances to the scientific enterprise and its many projects (Chadha & Thomas, 2022). Thus, it is not surprising that in looking for a discipline that could act as a binary opposition to science, the teacher’s first impulse was to choose ‘sociology’ or, as I presume, ‘social sciences’.

In fact, I argue that by locating D’s contradictory opinion within the domain of social sciences, the teacher is delegitimising that opinion in the classroom. Latour and Woolgar (2013) in *The Laboratory Life* write that ‘...the application of the term “sociology” to a study of scientific

activity will be regarded by many scientists as dealing primarily with all these “non-scientific” aspects of science’ (p. 20). Later, they add, ‘an important feature of fact construction [in science] is the process whereby “social” factors disappear once a fact is established’ (p. 23). Thus, by locating the question of the non-binariness of gender in sociology, the teacher can portray it as ‘non-scientific’. More importantly, for the gender binary to be cemented in the science classroom, the non-binariness of gender (what, for the teacher, is ‘social’) must be exorcised, and this exorcism requires distinguishing it from the perceived factuality of the gender binary. It is in this process of exorcism that the ‘deviant’ emerges: the deviant is not just deviating from the gender norm but also the norm of what is considered science. This deviant, therefore, is an ‘epistemological deviant’.

‘Thank God, We Are All Normal’: Epistemic Abjection and Making of the Normal (Sex) in Biology Classrooms

I was attending a class on mutation, where the professor was talking about human disorders. And the first thing that comes up is the ‘chromosomal aberration’...All these intersex variations have been termed as aberrations and disorders and abnormality...And then she’s going on and on and on talking about Turner’s [syndrome] and a bunch of other things, and she’s like, ‘Oh thank God, we are all normal.’ —D

In the quote above, D is talking about their experience in a biology classroom where the teacher is talking about chromosomal aberrations—defined as large changes in the number or structure of chromosomes (Preston, 2014)—in the case of human beings. Turner’s ‘Syndrome’—a condition where an individual has one X chromosome rather than the typical sex chromosome pairs of ‘XX’ or ‘XY’—in science classrooms is usually taught as an abnormality, by virtue of which intersex individuals with particular variations in their chromosomal conformations are simultaneously constructed as abnormal. More importantly, one must pay attention to the teacher’s relief upon having established—wrongly—that everybody in the class was ‘normal’.

Further, D talks about a practical class where students were staining cells for ‘Barr bodies’. Per Mittwoch, ‘A Barr body is a small, well-defined body which stains intensely with nuclear dyes. It is present in a large proportion of nuclei of female origin and absent in male nuclei’

(1967). Since D often restricts their gender expression to that of a stereotypical male individual while in their institution, when their cells showed a Barr body—seen as a determinant of the female sex—the teacher’s first impulse was to call it ‘debris’. When D told the teacher that they are intersex, the teacher asked, ‘How can you be so vocal about this?’

In the first quote, it is important to pay attention to how the teacher *constructs* a reality of the science classroom by believing that everyone in the class has normative chromosomal conformations, which is in contradiction to D’s *lived* reality of their sex. This is demonstrative of how biological classrooms invisibilise intersex bodies and the experiences of intersex individuals despite overwhelming evidence from biological research that points towards a non-binary reality of ‘biological sex’ (Fausto-Sterling, 2012). Thus, in contradiction to biological essentialism through which biology marginalises trans individuals (Ching & Chen, 2022), what is happening here is a dissociation of the ‘normal’ sex from the ‘biological sex’. An intersex variation is indeed a biological sex, but in the paradigm and imagination of the teacher, it is not a ‘normal’ sex. The biology classroom, therefore, is not a site where biological realities are discussed; instead, biological realities seem to be ignored to give way to ‘normal’ realities.

More importantly, I would like to pause at the sense of relief that the teacher expresses having constructed the classroom as a space marked by the presence of only ‘normal’ realities. Here, I invoke Julia Kristeva’s conception of ‘abjection’ from her seminal essay *Powers of Horror* (1982). In her essay, Kristeva talks about abjection as a process through which a subject constructs its subjectivity by violent expulsion of what it considers the ‘abject’ (something that attempts to disrupt the ‘symbolic order’ or the elements that a culture uses to construct and maintain a shared sense of reality). In D’s classroom, the symbolic order includes the belief that every individual is conforming to the teacher’s sense of a ‘normal’ sex. To prevent a disruption of this symbolic order, the teacher must expunge all possibilities of a biological sex that is not conforming to the boundaries of the ‘normal’. This expulsion happens through her dictum ‘we are all normal [here]’. Having expunged the possibility of disruption of the symbolic order, we see the teacher breathe a sigh of relief (or, ‘thank god’) for her sense of reality is preserved.

In the second quote, the disruption of the symbolic order happens through the unexpected yet visible Barr body. The first impulse of the teacher is to call it ‘debris’—a word invoking ‘dirt’ or ‘waste’. As

scholars have observed in the past, ‘dirt’ and ‘waste’ are associated as threats to the symbolic order, and registers of purity and pollution undergird the erection of spatial boundaries between the ‘proper’ and the ‘improper’ space (Fusco, 2006; Ghertner, 2015). For the teacher, categorising the Barr body as ‘debris’ can lead to the easy discarding of the uneasy observation, consolidating the symbolic order of a ‘normal’ sex once again. When D interrupts the symbolic order by disallowing the debrification of the Barr body through an articulation of their intersex identity, the teacher expresses shock. ‘How can you be so vocal about this’ is a rhetorical question that translates to ‘you must not talk about this’. For the symbolic order of the ‘normal’ sex to persist in all its purity, the vocalisation of non-normative biological sex must be seen as contaminating the discourse and, hence, silenced. The biology classroom, therefore, believes not in biological realities but in political realities that shape what its participants believe to be ‘normal’. I call this phenomenon ‘epistemic abjection’, where biological knowledges around (inter)sex are seen to threaten the symbolic order of knowledges that uphold and reify constructs of the ‘normal’ sex. Hence, to uphold the epistemology of the ‘normal’, the epistemology of the ‘biological’ must be cast as the abject and eventually, silenced or expunged.

What is critical about the epistemic abjection I attempt to describe above is that it differs from and interrupts the commonly invoked idea of the ‘biological as the normal’ that scholars of gender studies, trans studies and sexuality studies have long propounded (and rightly so) (Foucault, 1990). While it is true that biological essentialism is a key process through which science makes sense of genders and sexualities, in D’s articulation we see how biological realities and their ‘normal’ constructions can have contradictory tendencies.

Conclusion

In this article, I have demonstrated how exclusion in the science ecosystem—interpreted as who is allowed to participate in the process of scientific knowledge production, what knowledge is reified in the classroom despite contradictory evidence from *within* the sciences, and what knowledges are expunged from the classroom—shape the experiences of marginalised groups in a science higher education institution. For this, I have used vignettes of autobiographical narratives from a Muslim intersex trans student of science in a respected institution in an elite urban centre in India. These vignettes, while not a replacement

for more descriptive autobiographical accounts from intersectionally marginalised individuals themselves, enable the production of discourse that makes visible different registers employed in order to further their exclusions in science higher-education classrooms.

In the vignettes highlighted in this article, we see how D is excluded through the register of rationality; we see that as the interviewer sees D's Muslimness, the metonymic association between being a Muslim and being a potential threat to the nation is invoked. As a result, the upholding of national security—and in doing so, excluding D from the process of scientific knowledge production—emerges as a *rational position* of the interviewer. In a similar vein, in asking D not to be vocal about their intersex identity, the teacher deploys upholding personal safety as a rational position. Thus, D's exclusion is constructed as a product of their interlocutors' seemingly rational positions—albeit unfortunate ones—rather than of systemic and epistemic violence. As these rational positions shadow violence, they also become *political* positions.

Further, we see how a trinary between the 'normal', 'biological' and 'sociological' is deployed to dehumanise D. In the former case, D's articulation of more than two genders is termed as 'sociology', therefore, nonscientific, and therefore, a non-fact in the scientific paradigm—what I call an epistemological 'deviant'. In the latter case, by terming the unexpected Barr body as 'debris', the teacher essentially calls the very DNA of D as 'waste'. This is an illustration of how epistemic abjection is deployed to distinguish the normal from the biological and how, through this deployment, intersex bodies are constructed as the abject, the articulations of which must be silenced.

A sinister consequence of this silencing is the lost opportunity for the biology classroom to enable the validation of people's non-normative genders and sexualities and in doing so, increase their sense of belonging to the discipline. In a recent study that identified 'gender essentialism' as a 'master narrative' in biology curricula, trans respondents noted that 'counternarratives'—in this case, D's articulation of non-binary genders and the unexpected Barr body—offer biology classrooms the potential to validate their sense of self and, in turn, increase their sense of belonging in biology (Casper et al., 2022). Yet, as the respondents note, this potential is often unrealised, particularly because teachers ignore these perspectives. In the case of D, we not only see the teacher ignoring these counternarratives but also resorting to processes of deviant-making and abjection to solidify the exclusionary master narratives of cisnormativity in the classroom. While the unexpected Barr body, for instance, could

have been a moment of ‘productive confusion’ (Davison, 2008), any possibility of it interrupting the hegemonic discourse was eliminated by the teacher. This underscores Casper et al.’s findings that teachers in biology classrooms have the power to ‘create change’—a power that this article urges teachers to recognise and fructify to begin the task of dismantling processes through which intersectionally marginalised individuals are excluded from the Indian science ecosystem.

My attempt in this article has been to demonstrate (a) how intersectionally marginalised people face different registers of violence and exclusion in the Indian science ecosystem, and (b) how different intersecting identity and community locations shape an individual’s experience in science classrooms. That said, to test whether the conclusions of this study are applicable to larger questions of intersections and cross-talks between epistemology and identity, it is important that more autobiographical narratives of experiences of intersectionally marginalised groups in the Indian science ecosystem are encouraged. Further, the two conceptual propositions in this study—epistemological deviant and epistemic abjection—require more empirical work for their consolidation as theoretical concepts. The epistemological and methodological lesson from this study, however, is clear: we must listen to the experiences of intersectionally marginalised individuals to document their exclusions in the Indian science ecosystem and, eventually, drive the systemic and epistemic transformation of the said ecosystem to ameliorate these violent desires and exclusionary tendencies.

Acknowledgements

The author would like to thank Poonam Batra, Ayush Gupta and Bishal Kumar Dey for conversations critical to this manuscript. The author would also like to thank D for giving me their time and permission to draw from their narratives to write this manuscript and Lavanya N for meticulously transcribing my interview with D. D also reviewed the manuscript before final submission. The author would also like to thank the two anonymous reviewers from *Contemporary Education Dialogue* for their thorough engagement with the paper and insightful comments.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The research reported in this manuscript was supported by an early career fellowship from Transforming Education for Sustainable Futures (India) [Grant no. IN053E].

Notes

1. For details, see Datta (2023a).
2. Per Robinson, 'Interview research that has an *idiographic* aim typically seeks a sample size that is sufficiently small for individual cases to have a locatable voice within the study, and for intensive analysis of each case to be conducted' (p. 29).
3. The study protocol was approved by the institutional review board of the Indian Institute of Human Settlements (IIHS), Bengaluru.
4. Notable exceptions include a series of biographical comics by *TheLifeofScience.com* and a children's book on Dalit and trans technologist Grace Banu's life and work by *Pratham Books*.
5. 'Ally' is a term that refers to individuals who do not identify as a marginalised group themselves but support and encourage their equal participation in society and stand up against injustices against the said marginalised groups. In our conversations, D indicated the lack of a queer/trans collective in the institution where they were pursuing their postgraduate degree. In the past, campus queer collectives have been posited to provide support and affirmation to queer and transgender people in educational institutions. Further, these collectives have been also proposed to be spaces where 'queer students *and allies*' [emphasis mine] can come together (Vatsalya, 2021). An absence of campus queer/trans collectives, therefore, might indicate a lack of support for queer and trans students on campus.
6. The idea of 'hard' and 'soft' disciplines has also been posited to be deeply gendered. For more details, please see Light et al. (2022).

ORCID iD

Syantana Datta  <https://orcid.org/0000-0002-2913-2731>

References

- Appadurai, A. (2006). *Fear of small numbers: An essay on the geography of anger*. Duke University Press.

- Banerjee, A., & Rajam, S. (2022). *Indian courts must understand what being intersex means*. Smashboard. <https://smashboard.org/indian-courts-must-understand-what-being-intersex-really-means/>.
- BiasWatchIndia. (2022). *Base rates of STEM women faculty in India*. <https://biaswatchindia.com/base-rates-of-indian-women-faculty/>.
- Bilimoria, D., & Stewart, A. J. (2009). 'Don't ask, don't tell': The academic climate for lesbian, gay, bisexual, and transgender faculty in science and engineering. *NWSA Journal*, 21(2), 85–103.
- Bristow, W. (2017). *Enlightenment*. The Stanford Encyclopedia of Philosophy. <https://plato.stanford.edu/entries/enlightenment/>.
- Casper, A. A. M., Rebolledo, N., Lane, A. K., Jude, L., & Eddy, S. L. (2022). 'It's completely erasure': A qualitative exploration of experiences of transgender, non-binary, gender nonconforming and questioning students in Biology courses. *CBE Life Science Education*, 21(4), 1–19.
- Chadha, G., & Achuthan, A. (2017). Feminist science studies: Intersectional narratives of persons in gender-marginal locations in science. *Economic & Political Weekly*, 52(17), 33–36.
- Chadha, G., & Thomas, R. (Eds.). (2022). *Mapping scientific method: Disciplinary narrations*. Taylor & Francis.
- Ching, B. H. H., & Chen, T. T. (2022). Effects of biological determinism on beliefs and attitudes about transgender people: Psychological essentialism and biased assimilation. *Archives of Sexual Behavior*, 51(4), 1927–1942.
- Chunawala, S., & Ladage, S. (1998). *Students' ideas about science and scientists*. Homi Bhabha Centre for Science Education.
- Chunawala, S., Vinisha, K., & Patel, A. (2009). *Gender, science and schooling: Illustrations in science textbooks and students' and teachers' ideas related to gender* [Technical Report]. Homi Bhabha Centre for Science Education.
- Datta, S. & Kumar, P. (2023). Science, state and proactive conundrums: A transgender perspective. *Law School Policy Review*. <https://lawschoolpolicyreview.com/2023/05/28/science-state-and-procreative-conundrums-a-transgender-perspective/>.
- Datta, S. (2020). *A constant uneasy state: Trans people in STEM in India*. TheLifeofScience.com. <https://thelifeofscience.com/2020/11/09/transgender-people-in-science>.
- Datta, S. (2021). *Queer-trans people in STEM talk about their mental health*. IndiaBioscience. <https://indiabioscience.org/columns/indian-scenario/queer-trans-people-in-stem-talk-about-their-mental-health>.
- Datta, S. (2023a). *No space for some: Transgender, gender non-conforming and gender non-binary persons in the Indian science ecosystem* [Project Report]. Transforming Education for Sustainable Futures—India, Bengaluru: Indian Institute for Human Settlements.
- Datta, S. (2023b). *Marriage equality: Is 'biological sex' only defined by chromosomes and gametes?* The Wire Science. <https://science.thewire.in/the-sciences/marriage-equality-biological-sex-gender-science/>

- Datta, S., Mukherjee, D., & Gaikwad, P. (2022). *(Trans)forming science: Towards a transgender-inclusive science higher education in India*. TESF India, IIHS.
- Davison, A. (2008). Myth in the practice of reason: The production of education and productive confusion. In T. Leonard & P. Willis (Eds.), *Pedagogies of the imagination: Mythopoetic curriculum in educational practice* (pp. 53–64). Springer Science.
- Desiraju, G. R. (2008). Science education and research in India. *Economic & Political Weekly*, 43, 37–43.
- Fausto-Sterling, A. (2012). *Sex/gender: Biology in a social world*. Routledge.
- Foucault, M. (1990). *The history of sexuality: An introduction*. Vintage.
- Fusco, C. (2006). Spatializing the (im) proper subject: The geographies of abjection in sport and physical activity space. *Journal of Sport and Social Issues*, 30(1), 5–28.
- Ghertner, D. A. (2015). *Rule by aesthetics: World-class city making in Delhi*. Oxford University Press.
- Godbole, R. M., & Ramaswamy, R. (2015). Women scientists in India. In *Report on Women in Science and Technology in Asia, 11th AASSA (Association of Academies and Societies of Sciences in Asia) Regional Workshop on 'Gender issues in science research and education', Gender Summit* (pp. 67–84).
- Hampton, C., Reeping, D., & Ozkan, D. S. (2021). Positionality statements in engineering education research: A look at the hand that guides the methodological tools. *Studies in Engineering Education*, 1(2), 126–141.
- Harding, S. (1987). The method question. *Hypatia*, 2(3), 19–35.
- Harding, S. (1992). Rethinking standpoint epistemology: What is 'strong objectivity'? *The Centennial Review*, 36(3), 437–470.
- Harrison, P. (2017). Science and secularization. *Intellectual History Review*, 27(1), 47–70.
- Haverkamp, A. E. (2021). *Transgender and gender nonconforming undergraduate engineering students: Perspectives, resiliency, and suggestions for improving engineering education* [Doctoral Thesis, Oregon State University]. https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/gq67jz665
- Hegde, S. (2016). The gift of a life and death: Rohith Vemula and 'Us'. *Economic & Political Weekly*, 51, 28–30.
- Hooks, B. (2014). *Are you still a slave? Liberating the black female body*. The New School. <https://www.youtube.com/watch?v=rJk0hNROvzs>.
- Jain, D., & Rhoten, K. M. (2020). Epistemic injustice and judicial discourse on transgender rights in India: Uncovering temporal pluralism. *Journal of Human Values*, 26(1), 30–49.
- Jayaraman, T. (1997). *Why science is secular*. <https://www.imsc.res.in/~jayaram/Articles/lfrontline/node2.html#:~:text=Historically%2C%20science%20has%20been%20instinctively,breaching%20cultural%20and%20religious%20barriers>.

- Jones, T. (2018). Intersex studies: A systematic review of international health literature. *Sage Open*, 8(2), 2158244017745577. <https://doi.org/10.1177/2158244017745577>
- Jones, T., & Jacombs, A. (2021). Intersex and sexuality education: editorial introduction. *Sex Education*, 21(5), 497–503.
- Kant, I. (1787; 2002). *Critique of practical reason*. Hackett Publishing.
- Kaur, G. (2015). Curricular images of scientists: Textbooks and popularity of science. *Economic & Political Weekly*, 50, 71–76.
- Kersey, E., & Voigt, M. (2021). Finding community and overcoming barriers: experiences of queer and transgender postsecondary students in mathematics and other STEM fields. *Mathematics Education Research Journal*, 33(4), 733–756.
- Kondaiah, B. K., Mahadev, S., & Wahlang, M. G. T. (2017). The production of science: Bearing gender, caste and more. *Economic & Political Weekly*, 52(17), 73–79.
- Kristeva, J. (1982). *Powers of horror*. University Presses of California, Columbia and Princeton.
- Kurup, A., Maithreyi, R., Kantharaju, B., & Godbole, R. (2010). *Trained scientific women power: how much are we losing and why?* [IAS-NIAS Research Report]. https://www.ias.ac.in/public/Resources/Initiatives/Women_in_Science/surveyreport_web.pdf
- Latour, B., & Woolgar, S. (2013). *Laboratory life: The construction of scientific facts*. Princeton University Press.
- Light, A. E., Benson-Greenwald, T. M., & Diekmann, A. B. (2022). Gender representation cues labels of hard and soft sciences. *Journal of Experimental Social Psychology*, 98, 104234.
- Ministry of Human Resource Development. (2020). *National Education Policy*. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- Ministry of Science and Technology. (2020). *Draft science, technology and innovation policy*. https://dst.gov.in/sites/default/files/STIP_Doc_1.4_Dec2020.pdf
- Mittwoch, U. (1967). Sex chromatin. In *Sex Chromosomes* (pp. 175–216). Academic Press. <https://doi.org/10.1016/C2013-0-12515-9>
- Moizee, S. (2023). *Why are dalit students dying by suicide at India's prestigious universities?* The Quint. <https://www.thequint.com/videos/news-videos/why-are-dalit-students-dying-by-suicide-at-iit-iim-nit-central-universities>
- Morgan, D. L. (2008). Snowball sampling. *The SAGE Encyclopedia of Qualitative Research Methods*, 2, 815–816.
- Nanda, M. (2005). Postmodernism, Hindu nationalism and 'Vedic science'. In *Scientific values and civic virtues* (pp. 201–235). Oxford University Press.
- National Legal Services Authority v. Union of India. (2014). *WP(Civil) 400 of 2012*.

- Paliwal, A. (2023). How India's caste system limits diversity in science—In 6 charts. *Nature*, 613, 230–234. <https://www.nature.com/immersive/d41586-023-00015-2/index.html>
- Panchapakesan, N. (2017). Scientific temper and education: a framework for discussion. *Current Science*, 113(9), 1655.
- Preston, R. J. (2014). Chromosomal aberrations. *Encyclopedia of Toxicology*, 3, 955–958.
- Rishikesh, B. S. (2008). The 'Deficient' status of social science in India—Reasons and corrective measures. *Learning Curve*, 15, 18–22.
- Robinson, R. S. (2014). Purposive sampling. *Encyclopedia of Quality of Life and Well-Being Research*, 6, 5243–5245.
- Sarangapani, P. (2011). Soft disciplines and hard battles. *Contemporary Education Dialogue*, 8(1), 67–84.
- Sterling, R. (2023). 'Janet and John': Intersex invisibility in the New Zealand education curriculum. In *Sexual education around the world—Past, present and future*. Rogena Sterling. <https://www.intechopen.com/chapters/1134976>
- Subramanian, J. (2007). Perceiving and producing merit: gender and doing science in India. *Indian Journal of Gender Studies*, 14(2), 259–284.
- Subramanian, J. (2017). Beyond poverty and development: Caste dynamics and access to mathematics education in India. *Mathematics Education and Life at Times of Crisis*, 924.
- Subramanian, A. (2019). *The caste of merit: Engineering education in India*. Harvard University Press.
- The Transgender Persons (Protection of Rights) Act. (2019). <https://www.india-code.nic.in/bitstream/123456789/13091/1/a2019-40.pdf>
- Thomas, R. (2020). Brahmins as scientists and science as Brahmins' calling: Caste in an Indian scientific research institute. *Public Understanding of Science*, 29(3), 306–318.
- Thomas, R. (2021). *Science and religion in India: Beyond disenchantment*. Routledge.
- University Grants Commission. (2014). *Circular APA/383/20-A/ of 2014*.
- University Grants Commission. (2015a). *Circular 14-8/2014(CPP-II)*.
- University Grants Commission. (2015b). *Circular 91-2/2014(GS)*.
- University Grants Commission. (2016). *Circular F.91-7/2016(GS)*.
- Vatsalya, P. (2021). 'We aren't different, we are proud': The power of queer collectives on campus. Youth Ki Awaaz. <https://www.youthkiawaaz.com/2021/09/queering-campus-how-rainbow-collectives-help-ease-queer-students-lives/>