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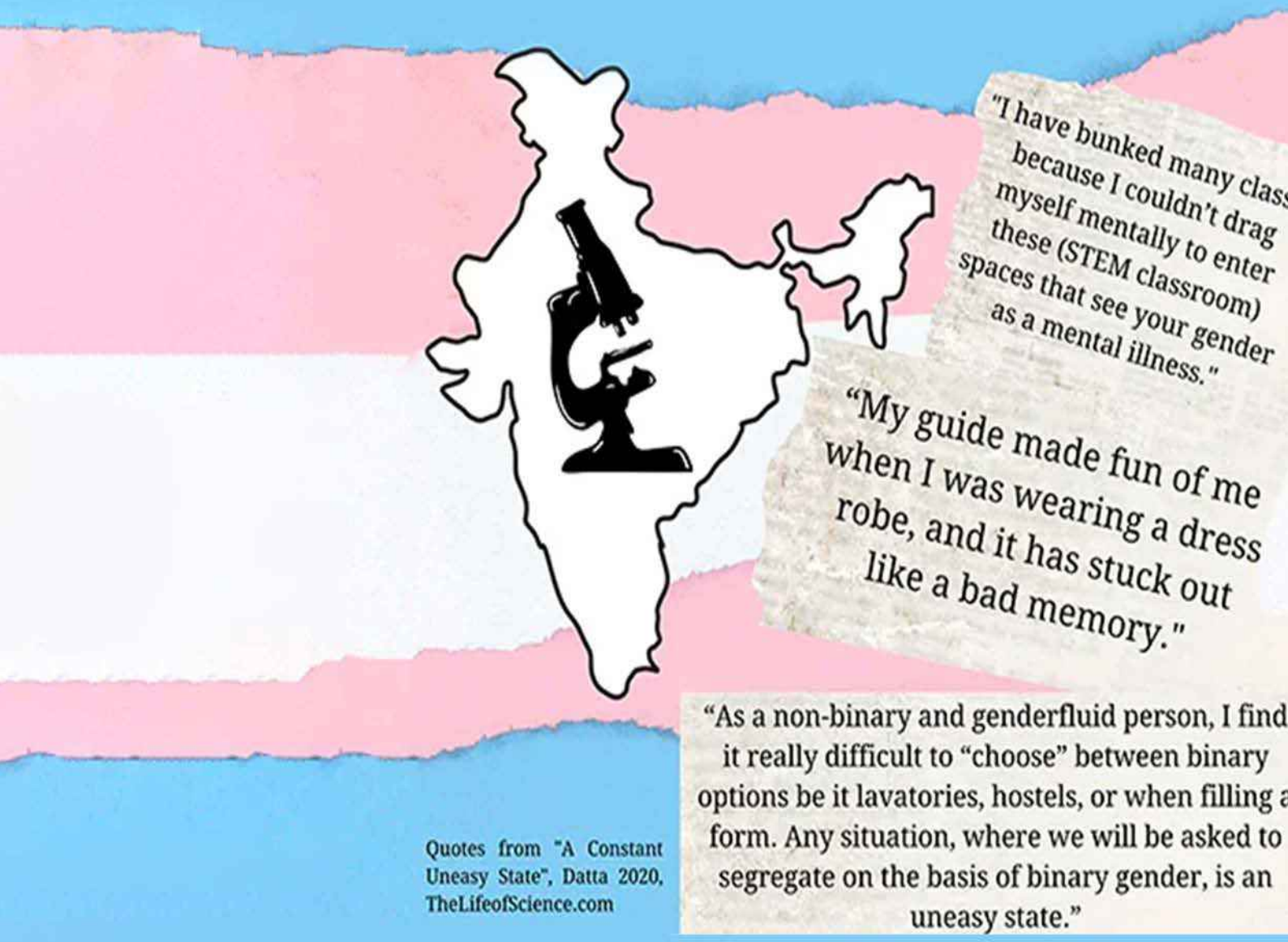

RESEARCH REPORT | MARCH 2023

NO SPACE FOR SOME

Transgender, Gender Non-Conforming and Gender Non-Binary Persons' Access to Science Higher Education in India

Principal Investigator: Sayantan Datta

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Research Team

Sayantan Datta, Debomita Mukherjee, Prajwal Gaikwad, Shreya Sridhar and Riya Parekh

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Editing: IIHS Word Lab

Design: Sathishkumar | Reviewed by: Prachi Prabhu and Padma Venkataraman | IIHS Communications and Design

Contact

sayantan@thelifeofscience.com

dsayantan@iihs.ac.in

TESF India Website: https://www.tesfindia.iihs.co.in/

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ABSTRACT

This project undertook a large-scale quantitative and qualitative investigation into the lived experiences of transgender, gender non-conforming and gender non-binary persons in the Indian science ecosystem. Towards this goal, the study used four key research methods: (a) applications under the Right to Information Act, 2005 to investigate the status of implementation of the legislative, judicial and policy documents that govern the access of transgender, gender non-conforming and gender non-binary persons to the Indian science ecosystem, (b) a policyscape approach to policy analysis to understand the effectiveness of the legislative, judicial and policy interventions that govern the access of transgender, gender non-conforming and gender non-binary persons to the Indian science ecosystem, (c) qualitative interviews and focus group discussions to understand the ways in which transgender, gender non-conforming and gender non-binary persons negotiate the Indian science ecosystem, and (d) a comparative historiography to understand and explicate the possibilities of political solidarity between different marginalised groups in the context of higher education in science in India, including caste-, gender-, and disability-marginalised groups.

From our study, the following key findings have emerged:

We have identified four registers that enable us to qualitatively study the mechanisms of exclusion that our research participants report being subject to. These registers are the exclusionary nature and culture of science, the gendered and segregated infrastructure, the lack of affirmative action, and the epistemically violent curriculum. Also, we have proposed the following six multidimensional and interlinked registers of exploring the co-construction of transgender and science identities – coming, becoming, longing, belonging, transforming, and queering – in a departure from the traditional registers of competence, performance, and recognition.

Through our policy analysis, we have identified the following legislative, judicial and policy documents that have a direct impact on transgender, gender non-conforming (GNC) and gender non-binary (GNB) persons' access to science higher education in India: The NALSA v. Union of India judgement, 2014; circulars from the University Grants Commission dated 2014, 2015 and 2016; the Transgender Persons (Protection of Rights) Act, 2019 (also published as the Transgender Persons [Protection of Rights] Rules, 2020); the National Education Policy 2020; the Draft Science, the Technology and Innovation Policy, 2020; and the Comprehensive Accessibility Guidelines and Standards for Higher-Education Institutions and Universities, 2022. Through applications under the Right to Information Act, 2005, we find an abysmal under-implementation of these documents and guidelines.

We find that these guidelines focus primarily on the idea of "inclusion", without deliberating on the ways in which the ecosystem requires transformation to enable this inclusion. We also find an overwhelming lack of focus on curriculum and pedagogy, which have been pointed out by transgender, GNC and GNB people as oppressive towards their identities and lived realities. Thus, we suggest a holistic reimagination of policymaking to address these critiques. We have suggested ways to improve the policymaking for transgender, GNC and GNB persons in the Indian science ecosystem in our policy brief at four distinct but related levels: general recommendations, infrastructural recommendations, policy-level recommendations, and curricular recommendations.

Using comparative historiography, we have critically evaluated transgender-rights, anti-caste, feminist,

and disability-rights discourses in the context of science higher education in India to explore provocative possibilities of political solidarity between different marginalised groups. We have proposed four registers of exploring these discourses – the nature and culture of science and science institutions, infrastructure, affirmative action, and curriculum – and highlighted the ways in which these registers offer possibilities of political solidarity. In essence, we argue that political solidarity–driven activism potentiates transformative and productive ways to challenge different forms of gendered, casteist and ableist violence in science higher education in India.

Keywords: science education; higher education; political solidarity; transgender studies

BACKGROUND

This project can be contextualised in the resounding call for increased diversity, equity and inclusion in the Indian science ecosystem, emerging from different socially marginalised groups, including transgender, GNC and GNB persons and people from marginalised caste locations (Department of Science and Technology, 2020; Datta, 2020; Datta, 2021; Paliwal, 2023; Ramvilas, 2022; Baruah, 2022). Core subjects of these diversity, equity and inclusion efforts are science institutions, which are, at least in the context of India, both research and teaching-learning institutions. Perhaps in response to the continued efforts of marginalised groups to breach the lofty walls of these gatekept institutions, these institutions have recently started critically engaging with questions of marginalisation and access. Some communities or groups that have been recognised as deprived of equitable access to science and science education in India include people from marginalised genders (for instance, cisgender women as well as transgender, GNC, and GNB persons), people from rural backgrounds, people with disabilities, and people from marginalised castes, classes and sexualities.

The rights of transgender persons to affirmative education have been recognised by the NALSA v. Union of India judgement from 2014 from the Supreme Court of India, the National Education Policy (NEP) 2020, and the draft Science, Technology and Innovation Policy (STIP) 2020, among other legal, judicial and policy documents. However, despite these conversations, judgements and policies, Indian science institutions remain abysmally inaccessible to transgender, GNC and GNB persons. As recent reports (TheLifeofScience, 2020; IndiaBioScience, 2021) demonstrate, transgender, GNC and GNB persons in the Indian science ecosystem have to face physical, mental and emotional harassment (of both sexual and non-sexual nature), social ostracisation and bureaucratic red tape, while constantly navigating an epistemically and institutionally exclusionary and oppressive ecosystem.

Against this backdrop, it becomes pertinent to investigate the lived realities of transgender, GNC and GNB persons in the Indian science ecosystem. Simultaneously, it is crucial to make the science ecosystem itself a subject of inquiry to understand the mechanisms of exclusion built into its epistemology, ontology and practice.

We began this investigation with the aim of enabling the imagination of targeted community-driven intervention for a trans-affirmative and inclusive science higher education and generating discourse at the intersections of transgender studies, science studies and science education.

AIMS AND OBJECTIVES

Our study has the following key aims:

(a) To generate meaningful, empirical evidence and community-driven discourse on transgender, gender non-conforming and gender non-binary persons' access to and experiences of science higher education in India.

(b) To critically evaluate the successes and failures of different legislative, judicial and policy interventions governing transgender, gender non-conforming and gender non-binary persons' access to science higher education in India.

(c) To understand and articulate the different epistemic and institutional registers through which transgender, gender non-conforming and gender non-binary persons are excluded from equitable participation in the Indian science ecosystem.

(d) To initiate community-driven policy intervention in the Indian science ecosystem to enable systemic change for the inclusion of transgender, gender non-conforming and gender non-binary persons.

(e) To drive a community-building endeavour between transgender-identifying science academicians and creative and communication practitioners to articulate new epistemologies of science education and exposition.

(f) To contribute to transformative reimaginations of science epistemologies and science practices that can contribute to the global and decolonial project of "queering".

RESEARCH QUESTIONS, METHODOLOGY, AND METHODS

Our key research questions were as follows:

(a) Who are the transgender, gender non-conforming and gender non-binary persons in the Indian science ecosystem? What are their social, political and geographical locations? Where in the academic hierarchy do they stand?

(b) What is their experience with the Indian science ecosystem? Are there systemic and systematic forms of exclusion that they face? If yes, how do these exclusions manifest in the institutional arrangements of doing and teaching science, assumptions about the nature of scientific knowledge and its epistemological underpinnings, and disciplinary frameworks and methods of inquiry in the sciences?

(c) Since many transgender, gender non-conforming and gender non-binary persons come to science institutions at the same time they are exploring their gender and/or sexuality,[1] we hypothesise that they must occupy a pluralistic and fluid identity, that is, the "science" identity and the "trans" identity of the individual might be co-constructed and co-produced. Thus, we question whether there is any relationship between the construction and production of an individual's science identity – a dominant epistemological identity – and their transgender identity – a marginalised social-political ontological identity. How do these identities intersect and interact with each other?[2]

(d) What are the legal, judicial and policy interventions that govern transgender, gender non-conforming and gender non-binary persons' physical, social and epistemological access to the Indian science ecosystem? How do transgender, gender non-conforming and gender non-binary persons perceive these interventions? How successfully have these interventions been implemented?

(e) What are the ways in which community-driven gender policy intervention can transform science and science education?

(f) How do we use an intersectional lens to examine the struggles for a trans-inclusive science higher education in the larger discourse of feminist, anti-caste and disability-rights critiques of science and science education?

To investigate these questions, we used a combination of applications under the Right to Information Act, 2005, retrospective and community consultation–based policy analysis, and qualitative interviews and focus group discussions with transgender, gender non-conforming and gender non-binary persons in the Indian science ecosystem. More details about each of these methodological approaches are as follows:

(a) **Right to Information Act, 2005:** We filed applications under the Right to Information Act, 2005 at 128 science higher-education institutions in India. These include a combination of primarily research institutions, central universities, and state universities. Due to logistical constraints and limits of the Right to Information Act, 2005, we could not file applications at private universities.

Our applications – prepared with support from lawyer and transgender-rights activist Kanmani Ray – were filed with the intention to document and map the following key information points regarding transgender, gender non-conforming and gender non-binary persons' access to the

[1] This is not to say that these are the only times that transgender, GNC and GNB persons explore their gender and/or sexuality.

[2] There is a strong possibility that the production and construction of science identity might intersect with that of other social identities (e.g., caste, class, linguistic community, etc.). For the purpose of this project however, we focused on the co-construction and co-production of science and transgender identities.

Indian science ecosystem:

(i) The number of transgender, gender non-conforming or gender non-binary persons who have applied, secured admissions or graduated from the institution in question in the last eight years (i.e., after the NALSA v. Union of India judgement 2014).

(ii) Whether the institution in question has implemented the relevant sections of the NALSA v. Union of India judgement 2014, the Transgender Persons (Protection of Rights) Rules, 2020, various circulars from the University Grants Commission, and the UGC (Prevention, Prohibition and Redressal of Sexual Harassment of Women Employees and Students in Higher Educational Institutions), 2015.

(iii) Whether there are any trans-affirmative policies and practices that the institution has put in place or planning to implement.

A copy of a sample application under the Right to Information Act, 2005, has been attached as Annexure I of this report. All questions were close-ended except one on a trans-inclusive curriculum, which did not yield insightful responses.

We received responses from 75 institutions at the time of filing this report. The responses were tabulated in an Excel sheet and colour-coded according to whether they reflected a positive response, a negative response, an ambiguous response, or a non-response. For questions asking for numerical data (e.g., the number of transgender students who applied in a particular time period), the number was used in our analysis rather than the colour code. Finally, we calculated the percentage of institutions that reflected each code category for each question to describe the scenario at an ecosystem level.

(b) **Retrospective and community consultation–based policy analysis:** For the policy analysis, we decided to work with the following legislative, judicial and policy documents that govern transgender, GNC and GNB persons' access to the Indian science ecosystem:

I. The NALSA v. Union of India (2014) judgement
II. Circulars from the University Grants Commission dated 2014, 2015 and 2016
III. The Transgender Persons (Protection of Rights) Act, 2019 (also published as the Transgender Persons [Protection of Rights] Rules, 2020)
IV. The National Education Policy 2020
V. The Draft Science, Technology and Innovation Policy, 2020
VI. The Comprehensive Accessibility Guidelines and Standards for Higher-Education Institutions and Universities, 2022

These documents were chosen as they remain the only influential legislative, judicial and policy interventions that aim to make science higher education in India inclusive of and accessible to transgender, GNC and GNB persons. Along with the aforementioned list, we read the Scientific Social Responsibility Policy, 2019 and the Madras High Court's 2021 judgement banning conversion therapy on medical practice and curriculum.

For the analysis of these documents, we formulated the analytical framework in the following manner:

(i) We read relevant literature and organised two online community-consultation sessions to understand the critical concerns of transgender, GNC and GNB persons in the Indian science ecosystem with respect to the aforementioned legislative, judicial and policy interventions.

(ii) We categorised these documents into three broad categories: policies on education, policies for the rights of transgender persons, and policies for science and technology.

(iii) In our observation, traditional approaches to policy analysis rarely analyse policies with respect to each other. Drawing from political scientist Suzanne Mettler's concept of "policyscapes", we attempted to locate the aforementioned interventions in the context of social and political moments that transpired in their coalescing, as well as in the context of each other. Thus, we took a policyscape approach in our analysis to identify (in)consistencies between these legislative, judicial and policy documents.

With this framework in mind, we proceeded to thoroughly analyse each of the mentioned documents to highlight the successes and lacunae in their imaginative or implementation potentials. Having identified the lacunae, we undertook community consultation to formulate recommendations for prospective policy interventions.

With these recommendations, we wrote the first draft of our policy brief, which was then sent for two rounds of online community consultation and feedback. The final draft was released as an open-source free-to-access document.

(c) **Qualitative interviews and focus group discussions:** To understand the experience of transgender, GNC and GNB persons in the Indian science ecosystem, and the way they negotiate their trans and science identities, we undertook qualitative interviews and two online focus group discussions with 10 transgender, GNC and GNB persons in the Indian science ecosystem in different stages of their academic careers in the cities of Mumbai, Bangalore and Hyderabad. Each interview was ~2 hours long and involved detailed life histories of the research participants along with semi-structured questions probing their experiences in the science ecosystem. Each focus group discussion was ~1.5 hours long; the focus of the first group discussion was policy interventions that could improve transgender, GNC and GNB persons' experiences in the Indian science ecosystem, and the second was centred around infrastructural issues faced by transgender, GNC and GNB persons in the Indian science higher education institutions.

The conversations were recorded and transcribed, followed by anonymisation and deidentification. Then, we undertook a thematic analysis of the transcripts and conceptualised the key themes that emerged.

We must mention that our thematic analysis of two interviews is yet to be completed, which we hope to complete in the next two months. Subject to the principal investigator securing funding

for continuing this project, we will conduct similar fieldwork in Kolkata, Chennai and Delhi (three other epicentres of elite science institutions in the country).

(d) **Comparative historiography:** Along with the key methodologies mentioned prior, we also undertook comparative historiography of trans-rights, anti-caste, feminist, and disability-rights discourses in the context of science and science education in the Indian context. This was done to contextualise the trans-rights discourse in the larger context of equitable science education in India, as well as to explore the possibilities of intersectional political solidarity between different marginalised groups in the context of science and science education in India.

For the comparative historiography, we looked at published personal narratives and news reports at the intersections of gender, caste, disability and science, judicial proceedings in cases filed by transgender persons in the context of education and employment, policy documents from the University Grants Commission and the Department of Science and Technology, and theoretical discourses on political solidarity and transgender studies. Most of these documents were published after the turn of the millennium.

KEY LEARNING AREAS

Broadly, our investigation has enabled us to understand better:

(a) science identity construction and negotiation;

(b) structural, ontological and epistemic mechanisms of exclusion and marginalisation in the science ecosystem;

(c) ways of community-driven policymaking;

(d) community- and solidarity-building in the science ecosystem.

Results from our study have provided first-of-its-kind comprehensive insights into mechanisms of exclusion that transgender persons face while accessing science education, as well as suggest mechanisms to make science education and science institutions more gender equitable.

Further, we have arrived at novel conceptual and theoretical frameworks to analyse:

(a) science identity construction and negotiation;

(b) policymaking in the Indian science ecosystem;

(c) registers of documenting marginalisation and oppression in the Indian science ecosystem.

While our study has focused largely on science education in an Indian context, we believe the insights from our study will speak globally to researchers interested in deliberating on inequalities and science higher-education

People and Relationships:

The goal of this project was to centre community building and to inform every step of the research with inputs from relevant stakeholders. In this spirit, research participants were identified through informal unstructured collectives of transgender, GNC and GNB individuals that existed prior to the beginning of this study that the lead researcher was familiar with. In this sense, purposive sampling was used to identify research participants for this study.

In the spirit of "nothing about us without us", we inculcated community-driven research as a core component of our project. Thus, this research study called upon different collaborators with different skillsets at different points, including interns, research participants, co-authors, transcribers, illustrators and reviewers, of which, more than half of the individuals identified as transgender, GNC, or GNB *(a detailed list of the individuals associated with this project is provided further)*.

This study has also enabled community building by connecting people from different marginal gender locations, institutions and academic career stages, and fostering a sense of collectivisation and collaboration among the stakeholders. We have also enabled crosstalk between feminist and queer critiques of science with anti-caste and disability-rights critiques of science to develop unique intersectional frameworks for science studies in India.

Here are the people whom this project called upon in various capacities while building meaningful connections *(names of research participants have been withheld for anonymity, as have the gender identities of the people mentioned)*:

Shreya Sridhar: Intern, handling quantitative analysis of data obtained from applications under the Right to Information Act, 2005; illustrated the cover of the policy brief.

Riya Parekh: Intern, handling comparative historiography of trans-rights, disability-rights, feminist and anti-caste critiques of science and science education; wrote the research manuscript titled "Towards a (Trans) Inclusive Science Higher Education in India: Notes on Political Solidarity and Its Possibilities", OSF Preprints, 2022.

Bishal Kumar Dey: Critical feedback on research manuscript titled "Towards a (Trans) Inclusive Science Higher Education in India: Notes on Political Solidarity and Its Possibilities", OSF Preprints, 2022.

Mukunth Vasudevan: Editor for the journalistic report titled "Indian Science Institutions' Curious Penchant for Gendered Hostels", The Wire Science, 2022.

Debomita Mukherjee and Prajwal Gaikwad: Research associates for policy analysis and writing of the policy brief.

Anand Grover, Bittu Rajaraman, Grace Banu, Kanmani Ray, Sunil Menon: Capacity building for policy analysis.

Ayush Gupta, Bishal Kumar Dey, BRC, Ritash, Satendra Singh, Sudarshan Kottai, Suraj Sanap: Community consultation for policy brief.

Ajeya: Illustrator for zine titled "Science Frictions".

Ayush Gupta, Bishal Kumar Dey: Consultation for zine titled "Science Frictions".

Saransh Bisht, Anushree Samant: Queer-affirmative counselling practices; trained mental healthcare practitioners.

Given that this project has already built a community of individuals interested in thinking critically about science and science education in India, especially from an intersectional trans-rights-activism lens, we hope to continue collaborating in the future. For instance, Ajeya and I are currently working to transform the zine (Science Frictions) into a biannual publication that can create space for transgender, GNC and GNB persons from different caste, class and (dis)ability locations to generate provocative discourse about science and science education in the country. For this, we have been awarded a grant by the ReFrame Institute of Art and Expression under their "Genderalities 3.0" funding opportunity.

In effect, we hope to build on the connections we have coalesced to continue aspects of the project further.

Capacities:

Capacity building for both, members of the research team and the relevant stakeholders was built into the design of this project. We took a multistep approach to capacity building where different capacities for the relevant stakeholders were strengthened before commencing the project, during the project, and after project completion. For instance, through our capacity-building webinar and dissemination of the policy brief, we have ensured that the knowledge about pre-existing policies and judgements that govern access to higher education in science in India (and their critiques) is available to the relevant stakeholders.

As a team, we have drawn on and strengthened the following capacities:

(a) We have used our grounding in social justice and intersectional feminist frameworks to analyse a series of judgements and policies to understand their impact on transgender, GNC and GNB persons accessing higher education in science in India.

(b) We have trained ourselves to understand the provisions of the Right to Information Act, 2005, and have learnt how to file applications under the act that elicit specific responses.

(c) We have used and developed our ethnographic and interviewing skills to collect life histories and experiential narratives of transgender, GNC and GNB persons in the Indian science ecosystem.

(d) We have honed our academic- and non-academic-writing skills in the process of drafting the policy brief, the zine, the journalistic report and the research manuscript.

Further, members of the research team pursued the mobile filmmaking course offered by the TESF team to explore possibilities of using documentary filmmaking to disseminate the findings of our study. While we could not implement our learning from the mobile filmmaking course within the duration of this project, we hope to use the skills learned in the near future.

We have pursued the following capacity-building exercises with our research participants:

(a) We conducted a closed webinar-cum-focus-group-discussion with established lawyers and activists who have summarised policies and judgements relevant to transgender, GNC and GNB persons in the Indian science ecosystem. Since information about these policies is not easily percolated to relevant stakeholders, we believe that this exercise helped stakeholders engage with and make use of these policies better.

(b) Through community-consultation processes and focus group discussions, we have connected transgender, GNC and GNB persons in the Indian science ecosystem across academic hierarchies to each other. We believe this will help not only in dealing with the feeling of being isolated as marginalised individuals in a specific epistemic ecosystem, but also in fostering community-building exercises.

(c) After the publication of the policy brief, we have written to lawyers, legal activists and transgender-rights activists in different states and legal organisations (e.g., Centre for Health Equity Law and Policy, Centre for Law and Policy Research) and policymaking bodies (Ministry of Science and Technology, Department of Science and Technology) to disseminate the policy brief to policymakers to intervene in the policymaking process. Further, we are considering liaising with non-governmental organisations (NGOs) and community-based organisations (CBOs) in different states (Centre for Health Equity Law and Policy, Centre for Law and Policy Research, Sappho for Equality, Centre for Women's Studies [University of Hyderabad]) in India to translate and disseminate the policy brief to activists at the grassroots.

Further, we are exploring funding opportunities that can help us sustain this research beyond the scope and duration of the current grant from the TESF-India team. As mentioned earlier, we have already been selected for a grant from the ReFrame Institute of Art and Expression to continue publishing our zine, Science Frictions, as a biannual publication that shall allow multiple transgender, GNC and GNB persons in the Indian science ecosystem to generate discourse around their epistemic and ontological relationship with their disciplines and workplaces.

KNOWLEDGE:

In this section, we summarise the pieces of knowledge generated by this project in the context of the key research questions. For this purpose, we have clubbed together a few research questions (as follows).

Who are the transgender, gender non-conforming and gender non-binary persons in the Indian science ecosystem? What are their social, political and geographical locations? Where in the academic hierarchy do they stand? What is their experience with the Indian science ecosystem? Are there structural, systemic and systematic forms of exclusion that they face? If yes, how do these exclusions manifest in the nature, culture and practice of science and science education?

To identify transgender, GNC and GNB persons in the Indian science ecosystem, we called upon informal collectives of transgender, GNC and GNB academicians in India, of which the principal investigator is a part. The call for participation was also circulated on the principal investigator's social-media handles. Most of the responses we received were from upper-caste and able-bodied individuals working in elite tier-I institutions in urban centres of the country. Further, we recruited research participants across different stages of academic careers within the tertiary sector of education, from undergraduate students to associate professors in research and education institutions. This background is necessary to contextualise our findings in the social, political and geographical locations of our research participants.

Existing literature has revealed that transgender, GNC and GNB persons report facing abuse and harassment (of both sexual and non-sexual nature), social ostracisation, and an undermining of their academic potential in the Indian science ecosystem (Datta, 2020; 2021). Further, they mention that they often feel excluded or like "outsiders" to the ecosystem. These forms of exclusion have been attributed to the gendered nature of science institutions, exclusionary, discriminatory or pathologising curricula, and an epistemological discourse that constantly "erases" their trans identity (ibid; Kondaiah et al., 2017). Thus, we argue that the perceived-value neutrality of science contributes to the different ways in which transgender, GNC and GNB persons feel excluded in the Indian science ecosystem.

Further, the literature also reports two pragmatic concerns that inhibit their equitable participation in the Indian science ecosystem. One is the lack of institutional bodies that can redress cases of harassment or discrimination against transgender, GNC and GNB persons, and the other is the bureaucratic red tape they often need to navigate to ensure their academic credibility is sustained after they choose to socially or medically transition (Datta, 2020; 2021). For instance, many transgender, GNC, or GNB persons change their names after they have made some progress in their academic career; as a result, it often becomes difficult for them to claim their previously published work (Datta, 2020). These pragmatic concerns must be addressed for the equitable participation of transgender, GNC, or GNB persons.

Based on conversations with our research participants and a survey of the literature, we have identified four registers that enable us to qualitatively study the mechanisms of exclusion that transgender, GNC and GNB persons report being subject to. These registers include the exclusionary nature and culture of science, the gendered and segregated infrastructure, the lack of affirmative action, and the epistemically

violent curriculum. We believe these registers would be useful to the larger community of education researchers in mapping inequalities in their respective fields of study, highlighting what we believe is the global epistemological contribution of this project. Further, these registers enable us to conceptualise political, solidarity-driven transformative activism in the Indian science ecosystem.

Here, we reproduce the conceptual foundations of these registers from our manuscript titled "Towards a (Trans) Inclusive Higher Education in India: Notes on Political Solidarity" (Parekh and Datta, 2022):

Exclusionary nature and culture of science: In this register, we investigate the ways in which feminist, anti-caste and disability-rights discourses have engaged with the question of what is considered science and who is considered a scientist, and what might these engagements mean for a (trans)formative reimagination of the Indian science ecosystem.

Traditionally, disciplines such as nutrition and midwifery, have been seen as disciplines that are pursued mostly by women and in which women excel; however, these disciplines have never been considered a part of "science" (National Council of Education Research and Training, 2006). These disciplines are deemed peripheral; they are seen as contingent on science, drawing from its myriad knowledge, but never contributing to it directly. Further, disciplines such as mathematics and physics have been traditionally and colloquially termed "hard", while disciplines such as psychology and biology are termed "soft". This binary is steeped in a masculinist phallocentric imagination that relies on confounding the credibility of knowledge with the perceived objectivity of the discipline. As Light et al. (2022) have shown earlier, this artificial distinction is also constructed around perceptions of which disciplines have more women practitioners; the more the number of women practitioners, the "softer" the discipline is perceived to be. This artificially constructed distinction has an impact on how disciplines with more women practitioners are perceived, with the ones with more female practitioners being devalued compared with the ones that have more male practitioners (ibid). Thus, Light et al. present a puzzling complication that critiques the simplistic idea that increasing the representation of women in a science discipline is sufficient to make the discipline more equitable; rather, their work shows that gender bias runs so deep in the sciences that a discipline itself gets marginalised when more women access it. Therefore, the fundamental approach to diversity, equity and inclusion needs a radical transformation that challenges stereotypical ideas about the competence of marginalised groups, and a dismantling of ideas of masculinity and femininity that undergirds the perception of science disciplines.

Simplistic and bioessentialist ideas of competence also contribute to the exclusionary nature of science education in India. For instance, apparent biological differences in cognitive ability between men and women have been used to deem women intellectually inferior (Gould, 1981). Similarly, as Kondaiah et al. (2017) mention, science's approach to disability is constantly coloured by the "failure framework". In 2022, Satendra Singh, a doctor, medical educator and disability-rights activist, pointed out the ableist undertone of the Wadhwa Committee report from the All India Institution for Medical Sciences (AIIMS), New Delhi (Datta, 2022). The Wadhwa Committee was tasked with formulating guidelines for doctors with disabilities to pursue specialities for their postgraduate education. However, as Singh (2022) points out in a report by The Wire Science, the report "does not describe even one speciality that candidates with locomotor disabilities in both their legs can pursue". In a similar vein, Renny Thomas' (2021) detailed

ethnography in "Science and Religion in India: Beyond Disenchantment" highlights how upper-caste scientists see themselves as naturally and culturally inclined towards the sciences, while people from marginalised caste backgrounds are seen as dispassionate and undedicated. Similar attitudes have been highlighted by Kondaiah et al. (2017), who have also written about how science education continues to perpetuate Brahminism and patriarchy both in its form and content. For instance, they speak about how biology is taught largely by way of the transmission model, where critical enquiry takes a backseat to foreground the Vedic practice of memorisation and regurgitation (ibid). The death by suicide of several marginalised-caste science students, including Rohith Vemula, Madari Venkatesh, and Anitha and Payal Tadvi, serve as a constant reminder to the institutional violence that people from marginalised backgrounds are subject to by science and science education. As feminist, anti-caste and disability-rights discourses remind us repeatedly, the language of competence is one of violence and it is through this violent exclusion that science and science education continue to function in insulated silos of male, upper-caste and able-bodied scientists.

What must our efforts towards a trans-inclusive science education incorporate from these critiques of science and science education? Since trans rights continue to be relatively less discussed in the context of equitable science education, legislative-, judicial- and policy-level interventions often interpret the question of access to inclusion of more trans, GNC and GNB people in the Indian science ecosystem. However, as Light et al. (2022) point out in their article, an increased representation is not meaningful unless gendered, casteist and ableist assumptions are shaken out of disciplines and their culture. Thus, it is important that the trans-rights discourse in the context of science education critiques and displaces the patriarchal, Brahminical and ableist nature and culture of science and science education while continuing its fight for the inclusion of trans, GNC and GNB people in the same.

Importantly, it is critical that political solidarity is embedded in trans interventions in the diversity, equity and inclusion discourse in science education. As Dalit trans activist Living Smile Vidya has argued previously, the lines between caste and gender are more blurred than they seem; Vidya has, in fact, likened transphobia to a form of Brahminism that is executed through similar metonymic associations between "dirty" work and the bodies that perform this work (Semmalar, 2018). Similarly, ideas of gender and disability as distinct analytics and social structures are constantly challenged by disability-studies scholars who are increasingly using the gender theories of Judith Butler (for instance) – especially concepts of abjection and liveability – in theorizing disability (Samuels, 2002). However, as Samuels (2002) argues, these blurry boundaries do not indicate that one term – like "gender" – can be simply replaced by another, like "disability". We see a critical pragmatic opportunity in these increasingly fuzzy theoretical and conceptual boundaries in that they allow political solidarity–driven trans activism to find footing. It is interesting that for such activism to be possible, trans activism in the context of science education must work from these fuzzy boundaries. Thus, it is not the mainstreaming of trans, GNC and GNB people that such activism must desire, but an annihilation of the very mainstream.

Gendered and segregated infrastructure: We are interested in the question of infrastructure not only because gender-affirmative infrastructure is a consistent demand of trans, GNC and GNB persons from science institutions,[3] but also because – as Susan Leigh Star points out in "The Ethnography of Infrastructure" (1999)

[3] In response to the Supreme Court of India's judgement in the matter of NALSA v. Union of India (2014), the UGC released a circular in 2015 that mandated the creation of gender non-segregated infrastructure in education institutions. However, as a recent report by The Wire Science highlights, this mandate is yet to be implemented (Datta, 2022).

– infrastructure is an entity that has often remained elusive to critical analysis. Leigh Star (1999) argues for an "infrastructural inversion", i.e., in her own words, "foregrounding the truly backstage elements of work practice" (ibid). In this section, we engage with critiques of infrastructure in science and science education from trans-rights, feminist, anti-caste and disability-rights discourses to foreground infrastructure not just as a tool of oppression, but also as a space requiring political solidarity–driven intervention for it to be truly affirmative of trans, GNC and GNB people.

Before we begin, however, we must take on the arduous task of defining what "infrastructure" is. For the purpose of this paper, we are restricting our understanding of infrastructure to material spaces of science institutions in the backdrop of which science and its practitioners exist. These include laboratory spaces, of course, but also hostels, washrooms, elevators, staircases, dining halls, canteens, etc. In summary, at least for our purpose, infrastructure represents the taken-for-granted material and mundane aspects of science institutions – aspects that are "problematic as any other" (Leigh Star, 1999) and often sites where dominant groups' violent desires of exclusion are transformed into the lived realities of the marginalised. In "Space, Segregation, Discrimination" (2021), Chayanika Shah and Chinmay Shidhore write about the segregated nature of space in the Indian Institute of Technology, Bombay (IIT-B), one of India's premier science education and research institutions, where "Hostel 10" – for a long time the only hostel housing women students on campus – was called the "Ladies' Hostel", while other hostels were referred to as "Students' Hostels".[4] According to Shah and Shidhore (ibid), this hostel was located away from all other hostels, right opposite to where the director's bungalow used to be, shrouded in surveillance. Further, they note that as the influx of women in the campus increased, the hostel was demolished and rebuilt several times to increase its occupancy, unlike the several new hostels that were built to accommodate the corresponding increase in the number of male students on campus (ibid). Segregation undergirds the discrimination against women students in the IIT-B campus, Shah and Shidhore (ibid) note, explaining the ways in which institutional infrastructures cannot be ignored in a critical conversation around science and science education. Feminist concerns around infrastructures are also reflected in "Saksham", a report brought out by the University Grants Commission in 2013. Notably, the report reflected on "the perceived neutrality in teaching practices" in science institutions and how this perceived neutrality affects these institutions' engagement with "social problems and power relations" (ibid). The report also foregrounded the question of infrastructure by highlighting that women in science institutions often work long hours in "relatively isolated conditions". However, the report cautioned against measures that restrict the mobility of women in these institutions. Critiques of infrastructure must enable the mobility of the marginalised, rather than restricting it and ghettoising them.

Anti-caste scholarship has also pointed out the overt and covert nature of caste-based segregation in science institutions. For instance, in 2018, the Indian Institute of Technology, Madras (IIT-M), another elite Indian science institution, segregated wash basins and the entry and exit points of a dining hall for vegetarian and non-vegetarian students (Senthalir, 2018). This segregation resembles a similar situation in upper-caste households, which usually had two entrances – one for upper castes and the other for "impure" lower castes, members of the Ambedkar-Periyar Study Circle pointed out (ibid). As this example demonstrates, rhetorics of purity and pollution – fundamental to the conceptualisation of untouchability and caste – garner institutional approval through segregated infrastructure. Thomas' (2020) ethnography

[4] Shah writes that the name was changed to "Hostel 10" after growing dissent from its residents in 1979.

in the Indian Institute of Science (IISc), another elite Indian science institution, shows similar segregation in the dining halls of the institute, where, of the three dining halls – A, B and C – the first is reserved for "pure vegetarian" food. As Thomas reports, this segregation is perceived by several non-Brahmin scientists as casteist (ibid). Such infrastructural segregation, Thomas notes, helps Brahmin scientists preserve their "cultural and caste memory" (ibid). This observation strengthens our argument that infrastructure is not a passive entity in science institutions, but a site where social and cultural exclusions are produced and reproduced.

Disability-studies scholarship has also highlighted the marginalising nature of infrastructure in education institutions. The very construction of a body as disabled is contingent on the infrastructure within which it exists. Disability, therefore, as scholars have argued, is not as much about the individual as it is about a social and structural construction (Shakespeare, 2006). In India, to enable persons with disabilities to access institutional spaces without discrimination and dependency, the Rights for Persons with Disabilities Act (RPWD Act), 2016 mandates infrastructural modifications to enable people with disabilities to access institutional spaces, including in educational institutions. Infrastructure is a key focus of the Ministry of Social Justice and Empowerment's "Accessible India Campaign". The RPWD Act, 2016 is notably reflexive in its mandate, mentioning that educational institutions need to survey students with disabilities every half a decade to understand their requirements and take steps to accommodate the same (ibid).

The trans provocation in these critiques of segregated infrastructure is foregrounding the binary nature of segregation. Thus, trans, GNC and GNB people have been demanding infrastructural modification that challenges the segregation of institutional infrastructure along the gender binary (Datta, 2020). However, infrastructures are set in stone – quite literally – making them relatively immutable and impervious to the reflexive and changing nature of trans concerns; that is, a "one-size-fits-all" approach is not ideal for intervention in infrastructure for a group of people as diverse in their identities and demands as trans, GNC and GNB people. Trans activism in the context of infrastructure, therefore, must actively engage with the task of what urban ecology scholar William Morrish (2008) calls "reflexive infrastructure". According to him, reflexive infrastructure constitutes three basic principles, which we reproduce as follows:

1. Infrastructure as a cultural repository of memories and future hopes.
2. Infrastructure as interdependent services and support systems that form the threads of the local safety net.
3. Infrastructure as a set of reciprocal transactions between civic authorities that promote the sustenance and equitable distribution of the local common wealth. (ibid)

Reflexive infrastructure, in our interpretation of Morrish's definition, enables infrastructure to be flexible and adaptable to hitherto unforeseen needs; in this case, of trans, GNC and GNB people, and is a result of a multilogue between various stakeholders, including trans, GNC and GNB people themselves and administrative, civic and policymaking bodies. It is the adaptability of reflexive infrastructure that also makes it "resilient" (ibid). Further, foregrounding reflexive infrastructure opens possibilities of political solidarity in critical interventions around infrastructure. As Morrish argues, "Reflexive and resilient infrastructure systems cannot be created through technological innovation alone; they require a fully engaged citizenry with a strong sense of shared purpose... Active citizen participation is fundamental to daily operation of sustainable infrastructure" (ibid). Reflexive infrastructure provides a "shared purpose" on which political solidarity can be enacted, and foregrounds "active participation" as an operative force behind the success of infrastructural interventions (ibid).

(Lack of) affirmative action and affirmative action policies: The term "affirmative action" was first used in an order signed by US President Lyngdoh Johnson in 1965 after he succeeded to the post in the aftermath of John F Kennedy's assassination (Fullinwider, 2018). This historical anecdote is important to us since it serves as a reminder that "affirmative action" is a mechanism born out of a perceived benevolent nation-state, and like all such measures, must be investigated with suspicion and caution. This is not to underplay the importance of affirmative action policies, but to generate conceptual discourse that enables critical engagement with the stakeholders of affirmative action and affirmative action policy.

We are interested in this critical engagement because of several observations. The arguments around Raya Sarkar's "List of Sexual Harassers in Academia" (Sharma, 2021) highlighted, among other things, the lack of faith many women have in institutional structures, despite these being put in place after decades of feminist interventions to safeguard their rights. Previous scholarship has also pointed out the ways in which science institutions particularly subvert institutional policies that are meant to increase the diversity of the student and faculty body. For instance, it has been previously noted that faculty in science institutions often evade punitive action when they sexually or non-sexually harass, abuse or violate people from marginalised backgrounds (Datta, 2020; Kondaiah et al., 2017). As Kondaiah et al. and Shah point out, owing to the heavily skewed power dynamics in science institutions where a single faculty member has complete control over a student's life and career, people from marginalised backgrounds are unable to report harassment or discrimination (Kondaiah et al., 2017).

In April 2021, videos showing Seema Singh, an associate professor at the Indian Institute of Technology, Kharagpur (IIT-Kgp), verbally abusing students from marginalised castes and/or those with physical disabilities during an online session surfaced on the internet in April 2021. What is striking is that the events took place during a preparatory course at the institute for willing students from marginalised-caste backgrounds and those with disabilities who clear the admission cut-off but do not obtain a seat. Students who pass the course may get admission a year later, but the faculty have the last say in determining whether a student gets the seat or not. This incident reflects two fundamental negligencies in contemporary affirmative action discourse. One, as Vaishali Khandekar, a research scholar at the Indian Institute of Technology, Hyderabad (IIT-H), has previously pointed out (Datta, 2021), Singh's sentiments are not unique; in fact, the uniqueness of the incident lies in the fact that it was captured on record. What Khandekar highlights is that despite affirmative action policies in place, they have failed to transform public consciousness and the subjugated state of marginalised people in science classrooms. The second negligency is related to the continuing subjugation. As the Seema Singh incident underscores, the usually upper-caste, cisgender, heterosexual and able-bodied faculty in these institutions exert enormous control over the lives and careers of students from marginalised backgrounds, which generates in them a sense of impunity. Further, as Kondaiah et al. (2017) point out, upper-caste male able-bodied academics who perpetrate caste or gender violence are exonerated through institutional cultures, which also place upon marginalised students that onus of "successes and failure". Thus, contemporary affirmative action interventions, while having had some success in increasing the representation of students from certain marginalised backgrounds in science institutions, have been largely unsuccessful in dismantling the power structure and institutional culture of merit and meritocracy that make exclusion and discrimination possible.

Further, affirmative action policies rarely seem cognizant of the different ways in which different marginalising forces are experienced by marginalised people. For instance, the National Education Policy 2020 (NEP 2020) claims that, "...the Government of India will constitute a 'Gender-Inclusion Fund' to build the nation's capacity to provide equitable quality education for all girls as well as transgender students". However, as has been pointed out previously, trans, GNC and GNB people often have concerns different from those of cisgender women (Datta, 2020).

This homogenisation of different marginalised groups offers an interesting challenge for the cause of political solidarity. We are compelled to ask, based on our observations, how political solidarity might exist without compromising the unique interventions demanded by different marginalised groups, many of which marginalise each other (for example, instances of casteism and transphobia by upper-caste feminists have been reported [Joshi, 2021; Feminist Futures Collective, 2021]). While we are unable to clearly answer this question (in fact, we are not sure if a "clear" answer to this question exists), we hope the background and the critiques of contemporary affirmative action discourse that we have provided can generate constructive and generative conversations that strengthen our hope and alleviate at least some of our anxieties.

Epistemically violent curriculum: Our interest in investigating curriculum is inspired by the fact that the abysmally low participation of trans, GNC and GNB people in the Indian science ecosystem has been, at least partially, accredited to the transphobic and cisnormative nature of science classrooms and curricula. For instance, it has been previously noted that science curricula do not engage with the concepts of gender and sexuality beyond pathologised descriptions of non-normative genders and sexuality (Datta, 2021). For instance, description of non-normative genders and sexualities are often limited to biology and medicine curricula and textbooks, and even in these cases, the descriptions occur largely in the contexts of diseases and disorder, which pathologises queer and trans individuals. Thus, this pathologisation of non-normative genders and sexualities in science curriculum grants scientific credibility to the social subjugation of these marginalized groups. In the backdrop of the NALSA v. Union of India (2014) judgement from the Supreme Court of India and the subsequent Transgender Persons (Protection of Rights) Act, 2019, the National Council for Educational Research and Training (NCERT) recognised the urgent need for an inclusive school curriculum and environment and released a teacher-training manual in 2021. The manual, among other things, proposed using the existing school syllabi – including the science syllabi – as a launching pad for discussing issues that concern trans, GNC and GNB students. The manual was, however, soon withdrawn after it received backlash from conservative voices on social media (Datta, 2021). In this backdrop, it becomes pertinent to ask what the trans provocation(s) in the context of curriculum might be and how these provocations may be driven by political solidarity.

As education researchers, the curriculum is of focal interest to us for its many dimensions (e.g., content, language, and images in textbooks) and the ways in which they produce and reproduce the Brahminical, patriarchal, transphobic and ableist social-political consciousness within which science education happens. Per our observations, there are two overarching focus points in interventions at the level of science curriculum in the Indian context: on the one hand, we see a demand to improve the representation of marginalised groups in the curriculum, and on the other hand, we see a demand to reframe the way content is presented – by means of modification of the linguistic and visual tools by which the content

is communicated – in science textbooks and classrooms. For instance, it is a well-recognised fact that the content in most textbooks very rarely represents women. Even when women are included in the curriculum, it is usually a perfunctory attempt at integration, where the authors of textbooks add a few names of women (for instance, Rani Laxmi Bai or Noor Jahan in history, or Gargi and Maitreyi in science) in the name of female representation. This mechanical approach at inclusion, termed the "add women and stir" approach (National Council for Education Research and Training, 2006), does not engage with fundamental questions of gender inequality. Interestingly enough, one of the changes that the 2021 NCERT teacher-training manual suggests is the representation of more transgender individuals as role models into the curriculum (Datta, 2021). As the 2006 position paper from NCERT on "Gender Issues in Education" points out, while necessary, such measures are not sufficient since they do not help in addressing the epistemological concern of "developing alternative frameworks of knowledge" that can challenge epistemic violence embedded in the curriculum, especially the science curriculum (National Council for Education Research and Training, 2006).

Feminist scholars have pointed out that apart from the content of the curriculum and textbooks, the textual and visual language used both within the text and by the teachers in a classroom impact how gender is constructed and negotiated in science classrooms. For instance, Emily Martin has written about how despite new research proving that the ovum plays an active role in reproduction in humans, the narrative of the "active" sperm and the "passive" ovum persisted in science textbooks (Martin, 1991). Also, as Martin has demonstrated, in conventional biology textbooks, a picture with an ovum that is enormously larger than the sperm is still titled "A Portrait of the Sperm" (ibid). Such linguistic misrepresentations are forms of epistemic violence that work bidirectionally; they cement traditional patriarchal archetypes, while also initiating students into them. However, all hope is not lost. Sam Long (2019) has described the ease with which students can be taught to use gender-sensitive language to provide an inclusive and dysphoria-free learning environment for all genders. While teaching a chapter on reproduction, for instance, he recollects asking students to consider whether the words "mom" and "dad" are inclusive and apply to everyone. After a critical discussion on gender, students feel comfortable using terms such as "biological parents" and can understand that the "patterns connecting gender, chromosomes, and egg and sperm are…generalized patterns, not absolute rules" (Long, 2019). Thus, the curriculum is a generative space that generates not only oppressive tendencies but also counter-tendencies of epistemic emancipation. Recognising the generative nature of curriculum opens a space for its (trans)formative reimagination.

As we engage with these discourses on curriculum, we cannot help but argue that the current curriculum does not question inherent power structures and its Brahminical, cis-hetero-patriarchal and ableist value systems. In our literature review, we observe a continuing lack of research on caste, disability and transness in the context of the science higher education curriculum in an Indian context,[5] indicating an urgent need for research on and critical engagement with these concerns. This concern holds true for trans concerns with respect to curriculum as well, although, thanks to previous feminist scholarship, we understand that the pathologising gaze of the curriculum built in registers of the gender binary and compulsory heterosexuality. Thus, the task of political solidarity in the context of curriculum and its critiques must

[5] For work on caste and curriculum in an Indian context in non-science disciplines or non-higher-education spaces, readers are requested to consult Mittal 2020 and Kain 2022. Also, Singh et al. (2020) published an important paper titled "Disability-Inclusive Compassionate Care: Disability Competencies for an Indian Medical Graduate", where they reflect on the competencies that an Indian medical graduate must demonstrate for compassionate care towards individuals with a disability. However, this study also does not provide critical insight into disability and the content or the textual and visual language of medical education in India.

begin by shining a light on the ways in which the nexus of casteism, ableism and transphobia shape the science higher-education curriculum in India. We must underscore the importance of the word "nexus" in the statement above; what we are suggesting is a shift in the way casteism, ableism and transphobia in the science curriculum is to be researched. Rather than looking at these as individual and distinct axes of marginalisation, it is important to recognise the nexus that enables the marginalising potential of these social-political structures.

We close this section by invoking a concept that we interpret in the context of political solidarity from Lissovoy's 2010 essay on "Decolonial Pedagogy and the Ethics of the Global: Curriculum against Domination". In the essay, Lissovoy talks about an "anti-dominative curriculum" that decentres both dominant content and standpoint in curriculum. Further, they argue that in along with this decentring, the anti-dominative curriculum posits possibilities of a "positive and synthetic project" that imbibes in students a disposition of respect for marginalised groups and the coexistence of cultures rather than their separation or assimilation into an ideal mainstream. Thus, in their words, "an anti-dominative curriculum can exceed the moment of negation and clear the space for the construction of a new and authentic global identification and solidarity" (ibid). The strength of Lissovoy's framework lies in the possibility of reimagining the notion of curriculum that it offers. Rather than an "organized content or educational experience", an anti-dominative curriculum is the "designation for the process of construction itself of an unprecedented knowledge" (ibid). Political solidarity makes it possible to imagine an anti-dominative curriculum that favours marginalised standpoints while constantly challenging the Brahminical, cis-hetero-patriarchal and ableist knowledge systems that drive science and science education in India.

Since many transgender, gender non-conforming and gender non-binary persons come to science institutions at the same time they are exploring their gender and/or sexuality,[6] we hypothesise that they must occupy a pluralistic identity. What we mean is that the "science" identity and the "trans" identity of the individual must be co-constructed and co-produced. Thus, we ask whether there is any relationship in the construction and production of an individual's science identity – a dominant epistemological identity – and their transgender identity – a marginalised social-political ontological identity. How do these identities intersect and interact with each other?

Traditionally, the idea of a "science identity" of marginalised groups has been explored at the intersection of three registers: competence, performance and recognition (Carlone and Johnson, 2007). However, neither of these is operationally well-defined. As several scholars have pointed out, these registers reek of a merit-driven understanding of science identity. As anti-caste scholars have highlighted merit is an oppressive social construct that excludes historically and socially marginalised groups in the way of a self-fulfilling prophecy (Thomas, 2020; Subramanian, 2015). Thus, we attempt to study the construction of a science identity through the self-reported experiences of our research participants to conceptualise different registers by which science identity can be explored in future research.

Based on our field data, we propose the following six registers of exploring science identity: coming, becoming, longing, belonging, transforming, and queering. We must mention that these registers are not spatiotemporally linear, i.e., they don't follow each other cleanly in the lives and experiences of our

6 This is not to say that these are the only times that transgender, GNC and GNB persons explore their gender and/or sexuality.

respondents. Further, these registers are not independent of each other and often inform and affect each other's construction. We have discussed these registers in detail in our zine "Science Frictions", and we are currently working on a research manuscript for publication soon. We are currently exploring whether these registers can also allow us to study the co-construction of other social identities – e.g., caste, class, etc. – along with science identity. However, since unlike the construction of transgender identity, the consolidation of caste and class identities perhaps happen much earlier, we currently believe that these registers, at least in part, are able to document only the co-construction of transgender and science identities. Here, we briefly document these registers and their implications:

Coming: This register allows us to explore the initial flirtations that transgender, GNC and GNB persons have with science and science institutions. The metaphor of a flirtation captures this register well; like flirtations, elements of curiosity, play and desire in these negotiations can be mapped using this register. For example, Morpheus, a research participant from Mumbai, said,

> There was this article in the *Scientific American* on gravity that was trying to describe how gravity can be thought about as this stretched rubber sheet. It introduced us to the ideas of space-time using this analogy. It tried to position what mass is – as distortions on the sheet. This was fascinating, I can think about the entire universe in this way. So the idea of physics is a way of exploring the universe, as a way of understanding better what our physical world is. That was just astounding.

Further, this register also allows us to understand the role that migration plays in the co-construction of transgender and science identities. Since elite science institutions are often clustered in urban metropolitan locations where there are simultaneously older histories of urban collectivisation of queer and trans individuals, research participants mention the freedom to explore both their gender and their journey in the sciences as enabled by their migration to these urban centres. For instance, Nyx, a research participant who migrated from Bhopal to Bengaluru for their higher education, mentioned,

> I was finally able to get away from my birth family and get away from Bhopal when I came to Bangalore. In Bhopal, I was not aware of the existence of queer groups because I was living with my parents, and I was not allowed to go out very much. Coming here was a very different experience for me; I could go out on my own terms, explore the city, and make friends outside of academic contexts.

Becoming: This register documents the reciprocal ways in which queer-trans people imbibe themselves in the science ecosystem, and how the ecosystem attempts to imbibe its value systems within individuals. Through this register, we have explored the conflict between the initial expectations of queer-trans people from the science ecosystem and their lived realities in this ecosystem. These negotiations between expectations and lived realities help us chart the compromises that queer-trans individuals have to make to become a part of the science ecosystem. This can be illustrated through the following narrative from Morpheus:

> [In science institutions], we are not just learning content – we are also forming communities and identities. We are shaping who we are in the world...Part of what you learn in an IIT is that there are statuses in the world, and that these statuses matter for what doors will open for you and what doors will not open for you. What an IIT cultivates beyond learning is a certain amount of conceit. It is a general sense of asshole-ry.

Longing: This register allows us to document the often lonely journey that queer-trans people undertake to continue being in the Indian science ecosystem. Complicating this journey is the structure and infrastructure of the ecosystem, seeped in cis-heteropatriarchy and ableism. Morpheus, for example, added,

> all conversations, be it curriculum, be it social life in the hostel, be it home life, there was a masculinist narrative. The way people would behave and interact made it very hard to really be a part of the group.... I could distinctly note that my social capital in that space is rock bottom.

Belonging: This register allows us to track the moments when queer-trans people identify with the science ecosystem. In our work, we find that an epistemological shift marks these moments of belonging; that is, rather than occupying the position of science's perceived value neutrality, our research participants report recognising that their queer-trans experiences inform their work in the science ecosystem.

For example, our research participant Morpheus reports finishing a PhD in physics, only to recognise that they wanted to do science education:

> In the fifth year of my PhD, I facilitated a dialogue course on sexuality and my co-facilitators were graduate students in counselling and in education. So secluded were the science and engineering departments that we didn't really know that these things were possible.... I was like, "This is what I want to do research on". It's like you recognise something, right? So I transitioned from doing physics in an engineering department, to doing education research in a physics department. I've come to see many of these transitions and existing in these strange spaces within departments as also a part of queerness. Being comfortable with doing education in a physics department and constantly having to argue that there is a legitimate place for you in there, it resonates and amplifies the experience of constantly having to argue with people that you have a space in this world.

Morpheus' experience would change later – in the same *queer* way they mention – once they recognised the lacunae in traditional physics education research:

> Later, I wondered: if physics and engineering have all of these problems about technocracy, about militarism, about meritocracy, then how does teaching people how to do physics better help? So my trajectory shifted again – from how do people learn physics to how can we help people learn physics better to how can we get engineering and physics students to think and talk about militarism? How can we get them to see that their disciplines are doing harm? How can we get them to challenge the narrative that science is always good for society? Again, these shifts are deeply grounded in queer identity and queer experiences.

In the future, we hope to theorise more on the idea of belonging, exploring the standpoints that such epistemological shifts produce.

Transforming: This register documents the ways in which the science ecosystem is transformed as a result of its efforts to assimilate queer-trans individuals within its imagined reality. Political solidarity and collectivisation undergird these transformations. To illustrate this, we take the case of a newly formed trans collective in an elite science institution in Bengaluru that has been mobilising queer-trans students in the campus to negotiate their demands with the institution's administration.

However, the collective's work has not been limited to only demands of queer-trans individuals. Rather, the collective organises a yearly burning of the *Manusmriti* and has been raising its voice against a dysfunctional SC/ST (Scheduled Castes/Scheduled Tribes) cell on campus.

Queering: We have defined "queering science" as follows:

- Acknowledging science as intricately linked to power that can be both emancipatory, and violent.
- Challenging strict categorisation of the world into cis- and hetero-normative, able-bodied and caste-laden categories.
- Challenging uncritical objectivity and reductionism in science.
- Acknowledging and challenging the reproduction of cis- and heteronormativity, ableism and casteism in science classrooms.
- Recognising and building solidarities between different forms of knowledge production and engaging with groups marginalised by science and its practice.

What are the legal, judicial and policy documents that govern transgender, gender non-conforming and gender non-binary persons' access to the Indian science ecosystem? How do transgender, gender non-conforming and gender non-binary persons perceive these interventions? How successfully have these interventions been implemented? What are the ways in which community-driven policy intervention can transform science and science education?

Through applications under the Right to Information Act, 2005, we find an abysmal under-implementation of the legislative, judicial and policy. Following this, we document the results from the analysis of the responses we received to our applications under the Right to Information Act, 2005.

The applications were filed via the "RTI Online" portal either directly to the institution if recognised in the portal or through filing the application under a department, institution or other government body. These included the University Grants Commission, through which applications were filed to the Rajiv Gandhi

University of Health Sciences, Bangalore University, Gulbarga University, University of Kerala, Mahatma Gandhi University, Savitribai Phule Pune University, University of Mumbai, Ravenshaw University, Punjab University, University of Rajasthan, Dr. M.G.R. University in Tamil Nadu, Bharathidasan University, Annamalai University, Anna University, Osmania University, Kaloji Narayana Rao University of Health Sciences, University of Calcutta, Presidency University, Jadavpur University, Rabindra Bharati University, Indian Statistical Institute (Delhi, Bangalore, Kolkata), and Institute of Chemical Technology.

Applications under the Department of Higher Education included the Institute of Post Graduate Medical Education and Research (Kolkata), National Institute of Technology (Hyderabad), Jawaharlal Nehru Institute of Post Graduate Medical Education and Research (Puducherry), and All India Institute of Medical Sciences (Jodhpur).

The applications for the National Centre of Biological Sciences, Tata Institute of Fundamental Research (Mumbai, Hyderabad) were filed under the Tata Institute of Fundamental Research in the portal.

Additionally, the applications for the Defence Institute of Advanced Technology and the Homi Bhabha Centre of Science Education were filed under the Ministry of Defence and the Department of Atomic Energy, respectively.

In total, applications were filed to 128 institutions, 107 of which were central government institutions and 21 were state government institutions. These institutions spanned 28 states (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand, and West Bengal), and 5 union territories (the Andaman and Nicobar Islands, Chandigarh, Delhi, Jammu and Kashmir, and Puducherry).

Of the 128 institutions to which applications were filed, responses were received from 91 institutions. Of these, 61 responses were counted towards the final analysis, while 30 responses were categorised as uncountable responses. Sixteen of these responses were marked invalid for not providing responses to the queries, while 14 of the responses were notifications of the application request being transferred to another body for response, from which responses were not received. The analysis consists of 75 responses on account of multiple responses received from departments or universities within institutions. These included two responses from Bangalore University from the Department of Electronic Science and the Department of Statistics, one response from Punjab University, and one response from Bhai Ghanaiya Ji Institute of Health under Punjab University. Additionally, 1 response was received from Mahatma Gandhi University, along with 12 responses in total from the School of Management and Business Studies, School of Tourism Studies, School of Indian Legal Thought, School of International Relations and Politics, School of Pedagogical Sciences, School of Environmental Sciences, School of Chemical Sciences, School of Behavioural Sciences, School of Computer Sciences, School of Letters, School of Biosciences, and the School of Gandhian Thought and Development Studies. The final analysis therefore included 75 responses across 61 institutions.

Of 75 institutions, responses were received from 59 institutions about whether they had a category for transgender persons in their application forms. Of these 59 institutions, 46 (77.97 per cent) included a column for transgender persons in the gender category in their application forms, of which few cited the applications of entrance exams like CAT, JEE and JAM having the aforementioned category. Seven universities (11.86 per cent) did not have a category for transgender students in their application forms, and three universities (5.08 per cent) reported that it is not yet included but will be. One university responded saying that interested candidates can apply "irrespective of sex". Another institute (AIIMS, Jodhpur) reported that the admission for all courses is done by AIIMS Delhi and reservations are according to the DoPT guidelines, and another deemed the query inapplicable. These responses were coded as ambiguous.

Of the 60 institutions that responded to the query on how many transgender persons applied to their institution, 10 institutions (16.67 per cent) reported having transgender applicant(s), of which one institute provided data only for 1 year, and disaggregated data is available for 8 years for the other institutions. Across these 10 institutions, a total of 237 applications were received from transgender students. Of these, AIIMS received a total of 61, Delhi University reported incomplete data but recorded 17 applications, the Indian Institute of Management, Raipur reported 4, the Indian Institute of Technology, Delhi received 3 applications, the Indian Institute of Technology, Gandhinagar reported receiving 16 applications, the Indian Institute of Management, Bangalore reported 84 applications, Indian Institute of Management, Nagpur received 21 applications, Indian Institute of Management, Lucknow reported 1 application, Indian Institute of Management, Indore received 1 application in the current year, and University of Kerala reported receiving 29 responses from transgender students. Forty institutions (66.67 per cent) reported that they did not have any transgender persons apply, of which 8 institutions did not have the category for transgender persons in their application forms. One institution that did not have the category as well deemed the query inapplicable. Information was unavailable in seven institutions (14.58 per cent) while one institution, which included the category for transgender persons in August 2022, reported that they do not have the records for the query but "are working to collect data from existing students". Additionally, of the 65 responses received for the query of how many transgender persons secured admission at the institutions, only 1 institution provided a positive response of 10 admitted students. Fifty three institutions (81.54 per cent) responded that no transgender person has secured admission at the institution, while 5 institutions (7.69 per cent) considered the query inapplicable. Information was unavailable in 6 institutions (9.23 per cent). Furthermore, a similar trend was observed in the 59 responses received for the query of how many transgender persons have completed/obtained a degree at the institution; 1 institution reported that 2 transgender students graduated, while 45 institutions (76.27 per cent) reported that no transgender persons have graduated from the institution. Ten institutions (16.95 per cent) had ambiguous replies or deemed the query inapplicable. Information was unavailable in 3 institutions (5.08 per cent). Overall, only a total of 211 transgender students applied across 10 institutions; 10 transgender students secured admission in one institution, and 2 graduated or obtained a degree from the institution.

Our application posed the question of whether the institutions have an overall institution-wide or programme-specific policy for transgender students. Of the 61 institutions that responded, 6 institutions (9.84 per cent) reported having a policy for transgender students, while 31 institutions (50.82 per cent) do not. One institution (1.64 per cent) reported that it was "under process" as "[t]he Institute has formed

Indradhanu in December, 2021 to look into the processes and concerns of transgender persons and LGBTQIA+ in general. The group has only recently started functioning" (emphasis ours). Eighteen institutions (29.51 per cent) provided ambiguous replies, of which 10 considered the question non pertinent to the responding office, or inapplicable presumably on account of there being no transgender persons in the institutions, with one institute (IIT Palakkad) stating that it "may be decided accordingly as and when required by the institute". Two of the institutions responded that they follow Government of India norms, while 3 stated that they have uniform policies for all students without discrimination or that the policies are "gender-neutral". One institution noted that they are "open to all possibilities". Information was unavailable in 5 institutions (8.20 per cent).

The application gauged information about the demographic and evaluation facilities in the institutions by asking the institutions whether they conduct periodical diversity surveys of their students, and if they assess the academic performance evaluation of transgender students in particular. Out of the 63 institutions that responded to the first query, 8 institutions (12.50 per cent) claimed that they conduct an annual/periodical diversity survey of their students, with one institution specifying that they performed "Gender Audits in 2015 and 2021", while 39 institutions (60.94 per cent) did not report conducting such assessment. The Jawaharlal Nehru Centre for Advanced Scientific Research provides data for the All India Survey On Higher Education (regulated by MHRD), which includes an evaluation of the gender demographic details of students, but it does not bear any mention of transgender students and is limited to male and female. Six institutions considered the query inapplicable. One institution (IIT Indore) stated that they "[collect] student's feedback from time to time", and one institution (IIM Lucknow), claimed that the "institute follows common rules/policies for all its students without any discrimination" while one institution (IIT Madras) claimed that they "periodically conduct seminar/talks on diversity". Information was unavailable in 7 institutions (10.94 per cent).

Of the 61 institutions that responded to the query on academic performance evaluation of transgender students, one institution (1.64 per cent) responded positively to the question, though the institute did not indicate that transgender students have studied there. Twenty seven institutions (44.26 per cent) reported that they did not conduct academic performance evaluation of transgender students, while 1 institution (1.64 per cent) stated that it was "not yet" carried out but "will be constituted". 3 institutions stated that they did not have a transgender student, and 17 institutions considered the query inapplicable, of which 2 institutions stated the reason to be the lack of transgeneder students at the institution. Four institutions indicated that academic performance evaluations are carried out commonly for all students, one of which added that it is performed for all "without discrimination". Information was unavailable in 3 institutions.

The application posed targeted questions to understand whether the institutions are in compliance with and have facilities to ensure and impose the Transgender Persons (Protection of Rights) Act, 2019 and the Transgender Persons (Protections of Rights) Rules, 2020. Broadly, most institutions were found to not follow these government guidelines and rules or have the facilities to regulate their compliance, particularly with respect to the designation of complaint officers, committees for harassment and discrimination against transgender persons, and equal opportunity policies for transgender persons.

The first query, which asked whether a complaint officer had been designated at the institution to deal with complaints relating to violating the provisions of the Transgender Persons (Protection of Rights) Act, 2019, received 44 responses. Out of these, two institutions (4.55 per cent) responded positively, of which, one institute (IIM Nagpur) stated that they have a "gender issue committee who is responsible for the above-mentioned aspects". Five institutions (11.36 per cent) reported that the facility was not yet provided, of which, one institute (IIT Delhi) stated that it is "under process", two institutions (IISER Kolkata, IIT Indore) reported that it is "under consideration", and one institution (Agharkar Research Institute) claimed that it "will be constituted". Eight institutions considered the query inapplicable, of which, two institutions cited the reason as lack of transgender students. Along similar lines, two institutions responded that they had not received such complaints yet, and one institution added that "[s]ince no transgender person is working in the institute, no complaint officer has been designated. As soon as any transgender person joins the institute, action will be taken as per act". Three institutions considered the Internal Complaints Committee (ICC) as a body to address complaints specific to violations of provisions of the Transgender Persons (Protection of Rights) Act (2020), and one institution reported that such matters can be handled by the students' "Faculty advisor - Inclusive Education". Information was unavailable in five institutions (11.11 per cent).

The second query asked whether any committee is accessible to transgender persons in case of harassment or discrimination as per Rule 10(8) of the Transgender Persons (Protection of Rights) Rules, 2020. Forty three institutions responded to the query, of which 2 institutions (4.65 per cent) responded with a "yes", while 17 institutions (39.53 per cent) did not have such a facility. Five institutions (11.63 per cent) insinuated being in the process of setting up such a committee, of which, one institution reported that the facility was "not yet" provided, two institutions reported that policy formulation was "under process", one institution (IISER, Kolkata) noted that it is "under consideration of the authority", and one institution (IIT Indore) reported that they do not have a "committee for addressing issues as there are common platform[s] and mechanism[s] for students to address their issues however, the process is under consideration". Seven institutions considered the query inapplicable, of which two institutions added that it is due to the absence of transgender students, one institution responded that it is inapplicable "as of now". One institution noted that no such cases had arisen. Five institutions cited other bodies; three institutions considered the ICC as the body to address harassment, of which, one further added that it can be accessed by "all genders", one institution cited the grievance redressal committee, and one institution cited "various committees, concerning hostel discipline, academic discipline, and complains concerning sexual harassment [being] in existence in the institute" along with "a well-placed guidance and counselling unit available for the students". One institution (IIM Sirmaur) provided an ambiguous reply stating that the facility is provided "[a]s per GoI norms".

The third query, which interrogated whether the institution has an equal opportunity policy for transgender persons as per Rule 12(2) of the Transgender Persons (Protection of Rights) Rules, 2020, received 43 responses. Of these, eight institutions (18.60 per cent) responded that they have such a policy, of which, one institution specified that the "protection of transgender persons is also included". One institution (IIT Madras) reported that "IITM Act No. 7(1) guarantees equal opportunity to all its students". Four institutions stated that the reason for the lack of equal opportunity policy was the absence of transgender persons

at the respective institution. Five institutions (11.63 per cent) hinted at being in the process of setting up such a committee, of which, one institution (Agharkar Research Institute) reported that the facility had "not yet" been provided but "[w]ill be displayed on [their] website as per guidelines"; two institutions reported that policy formulation was "under process"; one institution (IISER, Kolkata) noted that it is "under consideration of the authority". Seven institutions considered the query inapplicable, of which three institutions reported the reason as the absence of transgender students. Similarly, one institution responded that they "never had transgender student[s]", and one institution reported that no such case has arisen there till date. One institution indicated that the SC/ST/OBC Cell was equivalent to the facility in question. Three institutions provided ambiguous replies, stating that they follow Government of India, Ministry of Education, and GoI and ICAR policies and guidelines, respectively. Information was unavailable in six institutions (13.95 per cent).

Furthermore, the institutions were asked whether the details of complaint officers and equal opportunity policy were put up on the website or premises. Of the 43 institutions that responded, 13 institutions (30.23 per cent) claimed to have put up the information, while 14 institutions (32.56 per cent) did not. Four institutions (9.30 per cent) reported that it is under consideration of authority or under process. Five institutions considered the query inapplicable, of which, one stated it is due to the lack of transgender students, and one pointed to the response for the previous queries, which indicated that the facilities in questions had not been implemented at the institute. Additionally, one institution noted that no such cases had arisen at the institute, and one institution stated that "[n]o action is required at present". One institution reported that the details of the ICC were put up, but did not mention the specific facilities asked for in the query. IIM Tiruchirappalli provided a link to the information on their website, which did not have any directly accessible information on the aforementioned query. Information was unavailable in four institutions (9.30 per cent).

The institutions were asked if they have an equal opportunity cell, and the question received 47 responses. Of these, 15 institutions (31.91 per cent) reported having an equal opportunity cell, while 13 institutions (27.66 per cent) did not. Two institutions (4.26 per cent) responded that the facility is under consideration and under process, respectively. Two institutions considered the query inapplicable, one of which cited the reason as the absence of transgender students. Eight institutions cited other bodies, wherein two institutions highlighted the ICC, one institution mentioned student faculty advisors, and one institution responded that "[v]arious committees are constituted to ensure equal opportunities and for protection of interests of various categories of students and staff. The details are available on website", wherein the requested information was not found. Four institutions noted having SC/ST/OBC cells, of which, one mentioned that the functions of the equal opportunity cell were conducted by the "liaison Officer(s) for SC and ST, OBC and Minority and EWS". Two institutions reported that they follow equal opportunity policies, but did not mention an equal opportunity cell. One institution provided an ambiguous reply that they follow all government norms. Information was unavailable in five institutions (10.64 per cent).

The application further investigated whether the space, facilities, and amenities at the institutions were transgender-affirmative or -inclusive. For the same, the application poses questions on gender-neutral toilets and hostels/accommodation, medical healthcare, and mental-health facilities.

To the query of whether the institutions have gender-neutral toilets, responses were received from 46 institutions. Of these, 25 institutions (55.56 per cent) reported that they do not have gender-neutral toilets, while 8 institutions (15.56 per cent) reported that they did. Across these 8 institutions, AIIMS reported "7 [gender-neutral toilets] in CDER [and] nil in hostels", IIT Madras reported that "[e]ach building has a common toilet", NIEI has 4 gender-neutral toilets, IIT J&K reported having "8 gender-neutral toilets for PhD [but] no separate toilets for transgender persons". IIM Amritsar and ARI noted having one gender-neutral toilet each. IIM Indore stated that "[t]here are 12 separate toilets", which have been assumed to be common toilets. IISER Kolkata noted that "[w]hen the buildings of the institute were constructed, there were no specific guidelines regarding requirement of transgender person, [but] presently, as per requirement, [they] have created [a] toilet for transgender [persons] in the Research complex". Sikkim University responded that since they "are running our courses through [a] rented building, most of the building has separate toilets for [males] and [females]. In some cases, there are common toilets". In one institution (2.17 per cent) (IIM Indore), the facility is "under consideration". Eight institutions considered the query inapplicable, out of which, four institutions cited the reason being the absence of transgender students, and one of these institutions added that "there are dedicated restrooms in the hostels for PwD students that can be converted to gender-neutral toilets when required". Two institutions provided ambiguous replies of "[e]ach building has gender-friendly toilets" and that the institute is "compliant of all government norms", respectively.

The institutions were asked if they provide hostels or accommodation for the students, and the query received 49 responses. Of these, 43 institutions (87.76 per cent) provide accommodation, while 3 institutions (6.12 per cent) reported that they do not, of which, 2 institutions were found to be residential institutions. Three institutions (6.12 per cent) provided ambiguous replies, considering the query inapplicable, two of which stated the lack of transgender persons to be the reason for the same.

The institutions were simultaneously asked if they have provided transgender-friendly hostels or accommodation in the last eight years. Forty nine institutions responded to the query, out of which, 1 institution (IISER Kolkata) reported having "transgender-neutral hostels" (sic), while 21 institutions (42.86 per cent) did not provide transgender-friendly hostels or accommodation in the last 8 years. Fourteen institutions considered the query inapplicable, of which, five institutions stated the reason being the lack of transgender students, of which, one institution reported not providing accommodation. Six institutions additionally responded that they have not had transgender students in the last eight years, which was also resonated in the replies of some institutes that responded with having no transgender-friendly accommodation. Two institutions indicated that accommodation is provided to all students irrespective of gender. Information was unavailable in three institutions (8.16 per cent). Further, the institutions were asked if they had gender-neutral hostels, for which 51 responses were received. Of these, 11 institutions (21.57 per cent) reported that they had gender-neutral hostels, while 28 institutions (52.94 per cent) did not. Of the former, one institute reported having three gender-neutral hostels, while another reported a "gender-neutral wing along with a separate washroom". Eight institutions considered the query inapplicable, of which, four stated the reason being lack of transgender students. Three institutions provided ambiguous responses, of which, one institution responded that "[d]edicated hostels are available for respective genders", and one institution claimed to be "compliant of all government norms". One institute (IIM Shillong) stated that the hostels have "single room accommodation and

washrooms (on [a] sharing basis). Washrooms are equipped with western style [commode]. Hence, any transgender participant can be provided hostel accommodation". Information was unavailable in two institutions (3.92 per cent).

Lastly, on the subject of accommodation, the institutions were asked how many transgender persons have applied for hostel/accommodation facilities. The query received 48 responses, of which, 33 institutions (68.75 per cent) reported that no transgender students had applied, and no institution (0 per cent) reported having transgender students apply for accommodation facilities. Eight institutions considered the query inapplicable, of which, four stated the reason to be the absence of transgender students, which is presumed to be the reason for the other institutions as well; another institution also noted that there is an absence of transgender students. One institution responded that accommodation is open to "all categories of people".

The application posed questions to assess whether the medical and mental healthcare services are transgender-friendly or affirmative. A preliminary question of whether the institutions provide medical healthcare to the students was asked to establish where it is offered. Out of the 65 institutions that responded to the query, 56 institutions (86.15 per cent) provide medical healthcare services to their students while 6 institutions (9.23 per cent) do not provide medical/healthcare facilities apart from basic first aid or medical insurance. Three institutions (4.62 per cent) provided ambiguous replies, stating the question as being inapplicable or not pertinent to the office that responded. Subsequently, the institutions were asked if their healthcare facilities are transgender-friendly or affirmative. Twenty one institutions (35.59 per cent) responded positively, while 7 institutions (11.86 per cent) responded that they do not provide such facilities. Out of the 27 institutions (45.76 per cent) that provided ambiguous or miscellaneous replies, 10 institutions considered the query non-pertinent to the responding office or inapplicable, of which, 3 institutions stated it was due to the lack of transgender persons at the institution. One institution (NITPY) only reiterated that they provide healthcare services without further elaboration. Fifteen institutions stated that the healthcare services they provide are the same for all students, gender-neutral, and are accessible to all students without discrimination on the basis of gender. Information was unavailable in four institutions (6.78 per cent).

This query was also extended to mental healthcare services, and the institutions were asked if they provide transgender-friendly mental healthcare services to their students. Of the 60 institutions that responded, 13 institutions (22.03 per cent) responded positively, while 9 institutions (15.25 per cent) indicated that they did not. Of the latter, two institutions stated that they did not provide mental healthcare services at the institution. Thirty three institutions (55 per cent) provided ambiguous responses, out of which, 13 institutions considered the query inapplicable or non-pertinent to the responding office. Of the 13 institutions, 4 institutions implicated the lack of transgender students at the institution. One institution stated they had never had a transgender student, and another noted that there have been no such cases but provided a link where students can avail online mental healthcare services. Two institutions responded that they provide mental healthcare services and a student wellness helpline, respectively, but are unsure if they are transgender-friendly. Two institutions mentioned general health and healthcare facilities, respectively, being available to all students, without discussing mental healthcare, and one institution responded with "refer to reply for point no. 20", which stated that the "healthcare facility...is equally

accessible to all students". All other institutions' replies were indicative of common mental healthcare facilities for all students, but six institutions explicitly noted that they provide mental health services for all students irrespective of gender, out of which, one institution mentioned an LGBTQIA+ resource group. Seven institutions described what their mental health services constitute, which included a counsellor, tie-up with *YourDost* (an online counselling and emotional support platform), a professional counsellor along with *YourDost*, a mind care and wellness centre, psychological counsellors (one male and one female), an institute counsellor, and a clinical psychologist, respectively. Information was unavailable in five institutions.

As per the University Grants Commission guidelines in D.O. letter No.F.91-712016(GS), institutions are required to appoint gender champions; therefore, our application interrogated how many gender champions including transgender persons are appointed in the institutions. Out of the 56 institutions that responded, 26 had no gender champions appointed, while 5 institutions had appointed at least 1. Of these, three institutions appointed eight male and two female gender champions, six gender champions, and one gender champion per year in 2018–19 and 2019–20, respectively. Sixteen institutions (28.57 per cent) provided ambiguous responses, of which, 14 institutions considered the query inapplicable or non-pertinent to the responding office. Of these 14, 2 institutions implicated the lack of transgender students, and one institute noted that since they are a research organisation, they have in place an "internal complaints" as part of the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal Act, 2013). One institution stated that they have not had a transgender student. Additionally, one institution mentioned that they have "a Orenda: Gender and Sexuality Club…run by students for gender sensitisation and spreading awareness" with no mention of gender champions specifically. Information was unavailable in nine institutions (16.07 per cent).

The application consisted of questions to assess the internal complaints committees in institutions to address sexual harassment as per the UGC 2015 Regulations on Prevention, Prohibition, and Redressal of Sexual Harassment of women employees and students in higher-education institutions and/or AICTE Regulations, 2016. Firstly, the institutions were asked whether they have an internal complaints committee (ICC), to which 60 responses were received. 51 institutions (85 per cent) reported having an ICC instituted, while 1 institution (1.67 per cent) did not. Five institutions (8.33 per cent) responded with ambiguous replies. Of these, four considered the query inapplicable, of which, one stated the reason being the absence of transgender students. One institution stated that an "anti-ragging committee has been constituted [in] 2017". Information was unavailable in three institutions (5 per cent).

In the next query, the institutions were asked if their ICC recognises and accepts complaints filed by transgender persons, which was answered by 58 institutions. Of these, 4 institutions (6.90 per cent) responded in negative, while 23 institutions (37.93 per cent) claim that they accept complaints from transgender students, of which, 4 institutions note that they have not received such complaints yet. One of the institutions stated that on receiving a complaint from a transgender person, they follow the Ministry of Human Resource Development, Government of India, and UGC guidelines, and that the ICC accommodates complaints referred by the director under which transgender persons' complaints can be accommodated. Ambiguous replies were provided by 27 institutions (46.55 per cent), of which 12 institutions considered the query inapplicable. Of these, three institutions state the reason to be the lack

of transgender students at the institutions. Additionally, five institutions note that there are no transgender students at the institutions and/or that no such complaints have been received to date. Seven institutions state that their ICC accepts complaints of all students irrespective of gender or that they would accept any complaints under the purview of the act without further elaboration. One institution stated that they would accept complaints if there was a transgender student. One institution held that their ICC would accept complaints from any person who identifies as a woman, and cases not falling within those conditions would not be negotiated by the ICC. One institution stated that the "standing committee/ concerned person [accepts] the complaint[s] filed by all the students including transgender students" with no clear mention of the ICC.

The application asked institutions whether they had conducted sensitisation programmes to address the discrimination faced by transgender people on the teaching and non-teaching staff from 2014-2022. Fifty-six institutions responded to the query; of these, 21 (37.50 per cent) claimed that they had not. Of the latter, one institution stated that, being a non-academic (research) institute, they did not have teaching and non-teaching staff and students. Another added that the institute conducts orientation and sensitisation programmes under the Sexual Harassment of Women at Workplace Act 2013. Just 12 institutions (21.43 per cent) responded positively to the query; of these, 1 institution (MGU) clearly outlined its goals and methods:

> to conduct sensitisation programmes, campaigns/flash mob[s], poster competitions/short-film competitions for the students of [the] Social Science and Education Department of the University and to organise short term courses/training/orientation for BEd/MEd students and teachers regarding discrimination faced by the transgenders and various rights of transgender persons. (qtd. from MGU's response to our application under the RTI Act 2005)

This is considered the responsibility of the School of Pedagogical Sciences of the university. Another university mentioned that it has student clubs that organise such sensitisation programmes. Around 14 institutions (25 per cent) provided ambiguous replies; of these, 10 considered the query inapplicable. Of the latter, seven institutions stated the lack of transgender students as the reason. One institution claimed that the "sensitisation program is conducted for gender sensitisation" but provided no details; therefore, we could not determine if the sensitisation program indeed focussed on the concerns of transgender people and was transgender-inclusive and -sensitive. A similar lack of detail was observed in another institution that said that they had not held such sessions, but – contradictorily – also mentioned that the Women's Cell of the institute had conducted gender sensitisation programmes. One institution responded that such a programme was "under consideration," while another noted that though there had been no presentations specific to transgender people, various orientation programmes had been conducted for faculty and non-faculty in which "students [had] highlighted various social issues including discrimination faced by transgender persons". Information was unavailable from seven institutions (12.50 per cent).

To understand the extent of inclusion of transgender people in institutional facilities, the application questioned institutions on whether they had included a category for transgender people in sports. Fifty-three institutions responded to the query; of these, four institutions (7.55 per cent) responded yes, and one (1.89 per cent) said that it was "under process." Around 15 institutions (28.30 per cent) stated that they did not have the category;

of these, 1 institution noted that such a category had not been implemented as there had been no request for it. About 28 institutions (52.83 per cent) provided ambiguous responses. Of these, 21 deemed the query inapplicable; 6 justified this by the lack of transgender students at the institution. Five institutions claimed that their sports facilities could be accessed by everyone, and all members of the institution were encouraged to participate irrespective of their gender. Information was unavailable for five institutions (9.43 per cent).

Along with looking at institutional facilities, the application investigated whether the curriculum taught at the institutions was transgender-friendly. Fifty-five institutions responded to the query, of which one stated that it did not have curriculum-based programmes. Of the 55 institutions, 2 (3.64 per cent) said no, while 23 (41.82 per cent) said yes. The responses of 26 institutions (47.27 per cent) were ambiguous. Of these, 10 considered the query inapplicable; 7 stated the reason for this to be the absence of transgender students at the institution. Additionally, three institutions claimed that they had never had transgender students. One institution replied that its curriculum was available on its website; however, an assessment of the curriculum could not be conducted without an in-depth analysis of its content. Twelve institutions considered their curriculum gender-neutral. One institution noted that its curricula for various programmes were, as far as possible, based on gender equity, and that transgender concerns were included in them. Information was unavailable for four institutions (7.27 per cent).

The succeeding set of questions in the application investigated provisions for transgender students in the way of welfare and scholarship schemes. The first query specifically interrogated affirmative-action or welfare schemes for transgender people, including aids like fee concessions and academic support. This query was answered by 59 institutions, of which 22 (37.29 per cent) reported that they did not have such provisions in place. Three institutions (5.08 per cent) had established provisions; these included the Special Protection Scheme for transgender students "to provide learning assistance of ₹2,000 from the Student Welfare Fund to transgenders who did not receive other government benefits (UO No. 1571/2022/UOK, and UO No. 1572/200/UOK)," reservation of one seat for a transgender individual, and a fee concession. Responses from 30 institutions were ambiguous. Of these, 17 considered the query inapplicable; 1 asserted that it "may be decided accordingly as and when required," and 6 stated the reason for no schemes to be the absence of transgender students at the institution. Four institutions stated that their provisions and concessions were available to all students without discrimination along the lines of gender. From this statement, however, we were unable to conclude if transgender persons could access these provisions or concessions. Five claimed that they were following the norms and guidelines set by bodies like the Government of India and Ministry of Education; they had concessions and affirmative action for all eligible students. One institute noted that it had a nominal fee structure for all courses and was "not clear [on] whether affirmative concessions [we]re available for transgender persons." One institution stated that it had provisions for "affirmative action only in admissions and building infrastructure," without specifying whether any targeted transgender people. Information was unavailable for four institutions (6.78 per cent).

The second query looked at whether there were any scholarship schemes for transgender students; 59 institutions responded. Thirty institutions (50.85 per cent) did not have such schemes in place, while three (5.08 per cent) did. Of these, two institutions stated the provisions they had—the Special Protection Scheme and a fee concession for transgender students. One claimed that "steps have been initiated in this regard." Meanwhile, 24 institutions (40.68 per cent) provided ambiguous replies, of which 12 deemed the query

inapplicable. Seven of these stated the reason to be the lack of transgender students at the institutions. Two responded saying that they did not have transgender students. Seven institutions claimed that financial aid provided was gender-neutral and non-discriminating. Two responded that they followed government guidelines "from time to time", and that any scholarship schemes initiated by the government were open to all students. One institution noted that it provided "need based financial assistance to all participants." Information was unavailable for one institution (1.69 per cent).

The final query of the application investigated if, and how many, transgender people had joined institutions as teaching or non-teaching staff from 2014–2022. Sixty institutions responded, of which no institution reported having any transgender people as staff members. Four institutions (6.67 per cent) provided ambiguous answers, out of which three considered the query inapplicable. All three mentioned that there was a lack of transgender students at their institutions. One institution responded saying that it had never had transgender students. Information was unavailable for five institutions (8.33 per cent).

We have thus established the under-implementation of the aforementioned legislative, judicial and policy documents. Now, we turn to a more conceptual critique of them, with the intention of informing prospective policymaking. These interventions focus primarily on the idea of inclusion without deliberating on how the ecosystem requires transformation to enable this inclusion. Finally, we find an overwhelming lack of focus on curriculum and pedagogy. This has been pointed out by transgender, gender non-conforming and gender non-binary people as oppressive of their identities and lived realities. Thus, we suggest a holistic reimagination of policymaking to address these problems. In our policy brief, we propose ways to improve policymaking for transgender, gender non-conforming and gender non-binary people in the Indian science ecosystem at four distinct but related levels:

- General recommendations: These suggestions pertain to ecosystem-level changes that can enable transgender, gender non-conforming and gender non-binary people to pursue science higher education in India.

- Infrastructural recommendations: These propositions pertain to both the visible and invisible material infrastructures of science institutions.

- Policy-level recommendations: These pertain to policymakers, ministries and heads of institutions.

- Curricular recommendations: These are relevant to the curriculum and pedagogy practised within the Indian science ecosystem.

Readers may consult the entire brief for examples of the aforementioned recommendations (Datta et al., 2022).

How do we use an intersectional lens to locate the struggles for trans-inclusive science higher education within the larger discourse of feminist, anti-caste and disability-rights critiques of science and science education?

We have published insights on this question as a preprint. Here we reproduce the abstract of the preprint with minor modifications:

> Using comparative historiography, we critically evaluate transgender-rights, anti-caste, feminist and disability-rights discourses in the context of science higher education in India to explore provocative possibilities of political solidarity between different marginalised groups. We propose four registers for exploring these discourses—that of the nature and culture of science and science institutions, infrastructure, affirmative action and curriculum—and highlight how these registers offer possibilities for political solidarity. In essence, we argue that political solidarity–driven activism potentiates transformative and productive ways to challenge different forms of gendered, casteist and ableist violence in science higher education in India.

OUTPUTS AND SHARING:

A. Publications

Journalistic Publication

Datta, S. (2022). Indian science institutes' curious penchant for gendered hostels. *The Wire Science.* https://science.thewire.in/the-sciences/gendered-segregated-hostels-science-institutes/.

Academic Publication

Parekh, R., & Datta, S. (2022). Towards a (trans) inclusive science higher education in India: Notes on political solidarity and its possibilities. *OSF Preprints*. https://doi.org/10.31219/osf.io/zcv6k.

Policy Brief

Datta, S., Mukherjee, D., & Gaikwad, P. (2022). *(Trans)forming science: Towards a transgender-inclusive science higher education in India*. TESF India, IIHS. https://doi.org/10.13140/RG.2.2.20979.20007.

Forthcoming

Datta, S. (2023). *A cartography of transgender-inclusive education policyscapes in India* [Manuscript submitted for publication]. TransForming Rights: How Law shapes Transgender Lives, Identity and Community in India, Centre for Law and Policy Research.

Datta, S. (2023). Queering science: A vision for a new science [Manuscript submitted for publication]. In P. Kumar, R. Patgiri, & D. A. Dungdung (Eds.), *Sociology of gender in India: Contemporary issues and perspectives*.

Sridhar, S., & Datta, S. (2023). A quantitative investigation into the implementation of legislative, judicial and policy interventions for transgender-inclusion in the Indian science ecosystem [Manuscript in preparation].

Datta, S. (2023). Building a community where there is none: An exploration into queer-trans community building in Indian science institutions [Manuscript submitted for publication]. *Community Development Journal*.

B. Collaborations and Partnerships

Ajeya (illustrator for the zine) and I are collaborating to transform *Science Frictions* into a biannual publication.

Further Funding

We have been selected for funding from the reFrame Institute of Art and Expression to turn *Science Frictions* into a biannual publication.

C. Engagement Activities

To drive engagement with our outputs, we have made rigorous use of social media, including Instagram, Twitter, LinkedIn, Mastodon and ResearchGate.

Further, the principal investigator has delivered the following talks to disseminate their findings from the project:

Datta, S. (2022). *A policyscape approach to studying policymaking for a trans-inclusive science higher education in India*. TransForm 2022, Centre for Law and Policy Research.

Datta, S., Shaikh, A., Gupta, A., & Silversmith, A. (2022). *A primer to conducting inclusive research with transgender and non-binary community*. Initiative for Health Equity, Advocacy and Research – TransCare, Sangath India.

Datta, S. (2022). *Queering science*. IISER Mohali LGTBQIA+ Collective.

Datta, S. (2022). *Building a community where there is none: An exploration into queer-trans community building in Indian science institutions*. Department of Sociology, University of Hyderabad and Centre for Writing and Pedagogy, Krea University.

Datta, S. (2022). *Transgender, gender non-conforming and gender non-binary persons in the Indian science ecosystem*. Conversations, TISS-Azim Premji School of Education.

The principal investigator also participated in the policy meet organised by the TESF India hub to speak about their recommendations from the policy brief.

D. Influence on Policy, Practice and the Public

The project team has already written to several policymaking bodies, including the Ministry of Science and Technology, the Department of Science and Technology, the Department of Biotechnology, and the University Grants Commission, to share their insights on community-driven policymaking. Further, the principal investigator is expected to give an open talk at the Centre for Women's Studies, University of Hyderabad, to share their policy recommendations. This talk is expected to be attended by a university audience and open to people outside the university. Finally, a dissemination conference is being planned by the lead investigator.

This project has generated novel research methodologies, qualitative and quantitative data, and theoretical and conceptual frameworks. Thus, we are confident that our contributions will influence both scholarly and activist practice, as seen in the support this project has garnered from both scholarly and activist circles.

E. Research Tools and Methods

In this context, we have achieved the following outputs:

(i) It has demonstrated the success of using applications of the Right to Information Act, 2005 to study the lived realities of policy implementation, especially in the context of marginalised groups in education.

(ii) It has offered a research framework for multidimensional policy analysis by using the policyscape approach. This will help build context for future policy research studies, and evaluate the institutional nature of some of these policies.

(iii) It has provided a new model for studying science identity construction by critiquing the drawbacks of traditional models based on competence, recognition and performance, while providing new registers that allow for a more humanistic and intersectional study of science identity.

(iv) It has also offered a conceptual framework for queering science and science education that decentres Brahminical cisheteropatriarchal epistemologies and centres political solidarity–driven activism to shift epistemic standpoints in science and science education.

F. Research Datasets, Databases and Models

Through our applications of the Right to Information Act, 2005, we have generated a massive database of policy implementation in the context of a trans-inclusive Indian science ecosystem. The coded database is currently hosted here (Sridhar and Datta, 2023); the uncoded version will be made public after the

manuscript with our data analysis is posted as a preprint. This database will help future researchers studying the nature of trans inclusion or exclusion in the context of science education in India.

We have also proposed a novel model for studying science identity construction through the lenses of coming, becoming, longing, belonging, transforming and queering. We hope this model, following the publication of our research manuscript, will contribute to a paradigm shift in how science identity and community building are studied.

Finally, we have demonstrated the potential of political solidarity among different marginalised groups in the Indian science ecosystem. By offering an intersectional model of the study of political solidarity in a science education context, we believe we have furthered the discourse on how the collectivisation of marginalised groups can potentiate transformative epistemological and ontological changes in the Indian science ecosystem.

G. Artistic and Creative Products

The following creative product has been generated by the project:

Datta, S., & Ajeya. (2022). *Science frictions: A zine on trans journeys in science*. TESF India, IIHS. https://www.researchgate.net/publication/365375876_Science_Friction_A_Zine_on_Trans_Journeys_in_Science.

H. Awards and Recognition

The principal investigator has been recognised as one of the 20 most influential queer-trans people of 2022 by *Egomonk*. The compiled list of influencers has been published here: https://insights.egomonk.com/queertwenty-22/.

I. Other Outputs/Outcomes

We have centred community-driven research in science education and demonstrated its potential in generating insights crucial to the inclusion of marginalised communities, specifically transgender, gender non-conforming and gender non-binary people, in the Indian science ecosystem. Simultaneously, through our research, we have enabled community building between transgender, gender non-conforming and gender non-binary people in the Indian science ecosystem through focus group discussions and community-consultation processes. We have generated unique intersectional frameworks for science studies in India by integrating previous feminist concerns around gender and science and the inclusion of marginalised communities in the Indian science ecosystem. We have also combined essential connections within the community of transgender, gender non-conforming and gender non-binary people in the Indian science ecosystem, and the larger body of science education and science studies researchers in India. This enables us to continue our research, dissemination and advocacy work while networking with key stakeholders, communities and collectives.

Outcomes and Legacies:

The key legacy for this project is to encourage and facilitate tangible changes in the Indian science ecosystem to enable increased participation of transgender, gender non-conforming and gender non-binary people. Through this project, we have created a platform for conversation between relevant stakeholders—both policymakers and transgender, gender non-conforming and gender non-binary people in the Indian science ecosystem—to enable policymaking that actually addresses the concerns of the community rather than taking a perfunctory approach to equity and inclusion.

At the local and regional levels, this project has enabled community building and collectivisation of transgender, gender non-conforming and gender non-binary people in the Indian science ecosystem. At the national and international levels, we believe that this project has brought to the forefront a largely under-researched sociology of science, one that looks at the relationships that people from gender-marginalised locations have with the scientific establishment. We are currently looking for ways to scale up the project and continue our work beyond the scope and duration of the TESF engagement. Moreover, we are advocating for including discourses around higher education—particularly science education—in transgender-rights activist groups. Finally, we are hopeful that this project will contribute to the larger goal of queering science and science education in India and globally.

Challenges and Opportunities:

The following are the key challenges we faced, as well as opportunities that emerged, during the research process:

Our second focus group discussion received only a lukewarm response from transgender, gender non-conforming and gender non-binary people in the Indian science ecosystem. Despite eight people confirming that they would participate, only two people turned up. We attributed this to people's increasing fatigue with online events (what has been dubbed "Zoom fatigue"). We explored the possibility of physical focus group discussions, but because the research participants were spread across the nation, we could not conduct these sessions.

Since the principal investigator of the project is also a transgender and gender non-binary individual who has worked in the Indian science ecosystem, they are keen on informing the study with their own experience in the ecosystem. However, they are unable to compile their own narrative (autoethnography) coherently with those of others (ethnographies). They continue to discuss this issue with trained ethnographers and sociologists of science to understand what the best way might be to coherently interweave these two kinds of narratives.

As the relationship that transgender, gender non-conforming and gender non-binary people have with science has remained largely unexplored, we faced issues with finding analytical and theoretical frameworks to make sense of our observations. However, this provided us with the opportunity to pay attention to emerging narratives and life histories from the field and to push the boundaries of existing theoretical frameworks.

Finally, we were not able to publish a second journalistic report as promised to TESF India in our initial proposal. This is because the framing of our results from the study took an unexpected academic and theoretical turn. Rather than seeing this as a challenge, we recognised that this meant the results required dissemination in a different form. Therefore, we are working on multiple academic research papers towards this end.

TESF THEMATIC AREAS

Sustainable Development Goals:

Our project addresses the following sustainable development goals (SDGs):

SDG4: Ensure Equitable and Quality Education and Promote Lifelong Learning Opportunities For All

As a project that works with the concerns of intersectionally marginalised people and their higher education, particularly in the sciences, our study directly addresses this SDG by generating hitherto unexplored discourse on policymaking, policy implementation, and identity construction and negotiation in the Indian science ecosystem. Thus, this project provides detailed information on the various ways in which science and technology education continues to marginalise transgender, gender non-conforming and gender non-binary people. Simultaneously, it provides ways to imagine effective and productive interventions that can facilitate a reimagining of the science ecosystem in a trans-affirmative manner.

Further, we have critiqued perfunctory approaches to affirmative action, keeping in mind the historical moments that birthed "affirmative action" as an intervention approach. Rather than the top-down, affirmative-action approach, we posit a ground-up political-solidarity approach to transform the Indian science ecosystem for gender-marginalised groups, especially transgender, gender non-conforming and gender non-binary people.

SDG5: Achieve Gender Equality and Empower All Women and Girls

Our work, while deliberating on gender equality, is also a critique of this SDG since it functions within the cisgender binary. This project calls attention to the requirement to step beyond the cisgender binary and recognise that transgender, gender non-conforming and gender non-binary people require targeted empowerment and that the ambit of "women and girls" is itself a marginalising framework for the concerns of gender inequality in the context of education.

SDG10: Reduce Inequality Within and Among Countries

Our study speaks to the various interdisciplinary domains of global scholarship—science studies, science education studies and the sociology of science—that continue to examine the various ways the science

ecosystem marginalises people with non-normative gender identities. Through our work, we hope to provide implementable suggestions to increase the participation of transgender, gender non-conforming and gender non-binary people in the Indian science ecosystem, including ways to reduce educational inequality within the country. Simultaneously, we are exploring ways to contextualise our research within global scholarship, to compare marginalisation in the Indian science ecosystem to that in the global science ecosystem.

Cross-cutting Themes:

Our study addresses the following TESF cross-cutting themes:

Addressing Social Inequalities

Our project directly and critically addresses how science education, and educational institutions in general, marginalise transgender, gender non-conforming and gender non-binary people. In doing so, we contribute to and bolster understandings of educational institutions as reproducing social inequalities. That said, we also recognise the emancipatory potential of education, as expounded by Savitribai Phule, BR Ambedkar, Paulo Freire, bell hooks and others. Further, we acknowledge the generative and productive space in the infrastructure and curriculum of science institutions to bridge the social inequalities that transgender, gender non-conforming and gender non-binary people are subject to.

Foregrounding Marginalised Voices

Our research methodology has at its core the desire to foreground the voices and concerns of transgender, gender non-conforming and gender non-binary people. To make our project truly community-driven, we included community consultation at every stage of the research pipeline—the design of the study, data collection and analysis, and output production and dissemination. Further, more than half the contributors and all research participants are transgender, gender non-conforming or gender non-binary people. Finally, we recognise the limitations of conventional theoretical and analytic frameworks for analysing the data we collected. Keeping this in mind, we deliberate at length, on theoretical and conceptual levels, and offer novel paradigms for analysing policymaking and science identity construction, using our observations of the Indian science ecosystem.

Decolonising Research

We interpret the colonial tendency in science education research beyond the immediate ideas of race and ethnicity, and foreground the nexus of casteism, gendered heteropatriarchy and ableism that dominate science education research. Our study brings to light the various ways the discourse on science education research can progress by engaging with intersectionally marginalised groups and exploring the possibilities of political solidarity between these groups. Further, our research contributes to the global scholarship on inequalities in education, especially science education

.

Languages:

All contributors and research participants engaged in English. However, we are working towards translating our outputs into different Indian languages, including Hindi, Bangla and Telugu. These translation efforts are contingent on voluntary support that we hope to receive from the larger community of allies.

PROJECT SUMMARY AND LINKS

Project Summary:

This project involved a large-scale quantitative and qualitative investigation into the lived experiences of transgender, gender non-conforming and gender non-binary people in the Indian science ecosystem. Towards this goal, the study used four key research methods:

(a) applications of the Right to Information Act 2005 to investigate the status of implementation of the legislative, judicial and policy interventions that govern the access of transgender, gender non-conforming and gender non-binary people to the Indian science ecosystem;

(b) a policyscape approach to the analysis to determine the effectiveness of the legislative, judicial and policy interventions that govern the access of transgender, gender non-conforming and gender non-binary people to the Indian science ecosystem;

(c) qualitative interviews and focus group discussions to examine how transgender, gender non-conforming and gender non-binary people negotiate the Indian science ecosystem; and

(d) a comparative historiography to explicate the possibilities of political solidarity between different marginalised groups, including caste-, gender- and disability-marginalised groups, in the context of science higher education in India.

From our study, the following key findings have emerged:

Our research participants reported having faced abuse and harassment (of both sexual and non-sexual natures), social ostracisation and an undermining of their academic potential in the Indian science ecosystem. Further, they mentioned that they often felt excluded or like "outsiders." These forms of exclusion, according to our research participants, are often a result of the gendered nature of science institutions; exclusionary, discriminatory or pathologising curricula; and an epistemological discourse that constantly "erases" their trans identity.

Further, our research participants reported that two pragmatic concerns have inhibited their equitable participation in the Indian science ecosystem. One is the lack of institutional bodies that can redress cases of harassment or discrimination against transgender, gender non-conforming and gender non-

binary people, and the other is the bureaucratic red tape they often have to navigate to ensure that their academic credibility is sustained after they choose to socially or medically transition. We posit that these pragmatic concerns need to be addressed to ensure the equitable participation of transgender, gender non-conforming and gender non-binary people.

We have identified four ways to qualitatively study the mechanisms of exclusion that our research participants are subject to. These registers are the exclusionary nature and culture of science, the gendered and segregated infrastructure, the lack of affirmative action, and the epistemically violent curriculum. We believe these registers would be useful to the larger community of education researchers for mapping inequalities in their respective fields of study, highlighting what we believe is the global epistemological contribution of this project.

We propose the following six multidimensional and interlinked registers for exploring science identity—coming, becoming, longing, belonging, transforming and queering—departing from the traditional registers of competence, performance and recognition.

Through our policy analysis and applications under the Right to Information Act 2005, we have identified legislative, judicial and policy interventions that have a direct impact on transgender, gender non-conforming and gender non-binary people's access to science higher education in India. They include the NALSA v. Union of India Judgement 2014; circulars from the University Grants Commission dated 2014, 2015 and 2016; The Transgender Persons (Protection of Rights) Act 2019 (also published as The Transgender Persons [Protection of Rights] Rules 2020); The National Education Policy 2020; The Draft Science, Technology and Innovation Policy 2020; and The Comprehensive Accessibility Guidelines and Standards for Higher-education Institutions and Universities 2022. In applications of the Right to Information Act 2005, we find an abysmal under-implementation of these interventions.

We now turn to a more conceptual critique of them with the intention of informing prospective policymaking. We find that these interventions focus primarily on the idea of inclusion without deliberating on how the ecosystem must transform to enable this. Further, these interventions continue to marginalise transgender, gender non-conforming and gender non-binary people, while upholding a homogenous "mainstream" into which these marginalised groups must be assimilated. Finally, we find an overwhelming lack of focus on curriculum and pedagogy. This has been pointed out by transgender, gender non-conforming and gender non-binary people as oppressive of their identities and lived realities. Thus, we suggest a holistic reimagination of policymaking to address these issues. In our policy brief we suggest ways to improve policymaking for transgender, gender non-conforming and gender non-binary people in the Indian science ecosystem at four distinct but related levels: general recommendations, infrastructural recommendations, policy-level recommendations and curricular recommendations.

Using comparative historiography, we critically evaluate transgender-rights, anti-caste, feminist and disability-rights discourses in the context of science higher education in India, to explore provocative possibilities of political solidarity between different marginalised groups. We propose four lenses through which to explore these discourses—that of the nature and culture of science and science institutions, infrastructure, affirmative action and curriculum—and highlight how these registers offer possibilities for

political solidarity. In essence, we argue that political solidarity–driven activism potentiates transformative and productive ways to challenge different forms of gendered, casteist and ableist violence in science higher education in India.

Links to Project Resources:

The following links have outputs of the project:

Datta, S. (n.d.). *(Trans)forming Science*. Sayantan Datta (they/them). https://www.sayantanspins.com/trans-forming-science.

Datta, S. (2022). Indian science institutions' curious penchant for gendered hostels. *The Wire Science*. https://science.thewire.in/the-sciences/gendered-segregated-hostels-science-institutes/.

Datta, S. (2022). *(Trans)forming science: Towards a trans-inclusive science higher education in India*. Sayantan Datta (they/them). https://www.sayantanspins.com/_files/ugd/d1a74d_25060e6ebb914c29a5c33a811415e780.pdf?index=true.

Datta, S., & Ajeya. (2022). *Science frictions: A zine on trans journeys in science*. TESF India, IIHS. https://www.researchgate.net/publication/365375876_Science_Friction_A_Zine_on_Trans_Journeys_in_Science.

Parekh, R., & Datta, S. (2022). *Towards a (trans) inclusive science higher education in India: Notes on political solidarity and its possibilities*. OSF Preprints. https://osf.io/zcv6k/.

ANNEXURE I: APPLICATION FOR SEEKING INFORMATION UNDER THE RIGHT TO INFORMATION ACT 2005

TO
The Public Information Officer

Subject: Application for Seeking Information under the Right to Information Act 2005.

Part I

1. **Name of Applicant**: Sayantan Datta
2. **Gender**: Non-binary
3. **Address**:
4. **Telephone/Mobile No.**:
5. **Email ID**: dsayantan@iihs.ac.in

Part II

I. Please provide the following information:

1. If you have included an option for transgender persons under the category of gender on all the forms and applications to your institution for your graduate, postgraduate, research and integrated programmes.
2. How many transgender persons have applied for admission to any programme in your institution in the last eight years?
3. Is there any entrance exam or admission test for any programme at your institution?
4. How many transgender persons have secured admission at your institution in the last eight years?
5. How many transgender persons have completed or obtained any degree at your institution?
6. Does your university/institution have any overall institution-wise or programme-specific policy for transgender students?

7. Does your institution conduct an annual/periodical diversity survey of its students?

8. Has there been any academic performance evaluation of transgender students at your institution?

9. Has a complaint officer been designated at your institution to deal with complaints relating to the violation of provisions of the Transgender Persons (Protection of Rights) Act 2019?

10. Does your institution have a committee accessible to transgender persons in case of any harassment or discrimination as per Rule 10(8) of the Transgender Persons (Protection of Rights) Rules 2020?

11. Does your institution have an equal opportunity policy for transgender persons as per Rule 12(2) of the Transgender Persons (Protection of Rights) Rules 2020?

12. Has your institution published the details of the complaint officer and equal opportunity policy on its website or at conspicuous places on its premises?

13. Does your institution have an equal opportunity cell?

14. How many separate toilets or gender-neutral toilets are there for transgender persons on the institution premises?

15. Does your institution have hostels or accommodation facilities for students?

16. Has your institution provided transgender-friendly hostels and hostel committees or other accommodation facilities for transgender students in the last eight years?

17. Does your institution have gender-neutral hostels?

18. How many transgender persons have applied for hostel/accommodation facilities at your institution?

19. Does your institution have any medical/healthcare facilities for students?

20. Are the healthcare facilities, if any, at your institution, transgender-friendly or affirmative?

21. Does your institution provide any transgender-friendly mental healthcare services to students?

22. How many gender champions, including transgender persons, have been appointed by your institution as per University Grants Commission's Guidelines in D.O. letter No.F.91-712016(GS)?

23. Does your institution have an internal complaints committee to deal with sexual harassment complaints as per the UGC (Prevention, Prohibition and Redressal of Sexual Harassment of Women Employees and Students in Higher-educational Institutions) Regulations 2015 and/or AICTE Regulations 2016?

24. Does the internal complaints committee at your institution recognise or accept complaints filed by transgender persons?

25. Has any sensitisation programme for teaching staff, non-teaching staff and students been conducted to address discrimination faced by transgender persons in the last eight years at your institution?

26. Has your institution included a category for transgender persons in sports?

27. Is the curriculum for all the programmes at your institution transgender-friendly?

28. Is there any affirmative-action/welfare scheme for transgender persons at your institution, including fee concessions, academic support, etc.?

29. Are there any scholarship schemes for transgender students at your institution?

30. How many transgender persons have joined your institution as teaching and/or non-teaching staff in the last eight years?

ii. Whether the application fee of ₹10 has been paid and, if so, please specify the mode of payment: Yes, Online

Declaration of the Applicant

(a) I am a bona fide citizen of India and owe allegiance to the sovereignty, unity and integrity of India and have not voluntarily acquired the citizenship of another country.

Place: Sri City

Date: 17 September 2022

(Signature of the Applicant)

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TE|SF

TESF is a GCRF funded Network Plus, coordinated out of the University of Bristol, working with partners in India, Rwanda, Somalia/Somaliland, South Africa the United Kingdom and the Netherlands.

We undertake collaborative research to Transform Education for Sustainable Futures.

TESF partner institutions are:
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Transparency Solutions
University of Bristol
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University of Rwanda
Wageningen University

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