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The Emotional and Corporeal Dimensions of Belonging to STEM Education

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Abstract: This paper explores the politics of belonging in STEM education contexts by foregrounding emotions as an analytical lens. We show how political projects of belonging are constructed/resisted *affectively* in two different STEM postsecondary contexts, within a technical college and a university in Canada. Belonging is examined along two interrelated dimensions: having the 'right' kind of body and emoting in the 'right' kind of way. Those dimensions reveal subtle and pervasive practices of exclusion and marginalization as science students experience their belonging to STEM fields and to Canada. We discuss how a multi-scalar analysis of bodies and emotions in relation to various spaces and various social relations could reveal more layered understandings of how bodies become distributed/valued within STEM fields.

Theoretical background and purpose

Research on emotions in science education have been garnering increased attention (e.g., Bellocchi et al., 2016). This is in response to a cognitivist bias in science education, that has been attributed to "a long-standing Newtonian–Cartesian tradition of separation, prizing apart the mind and body, divorcing and polarizing reason from feeling" (Alsop & Watts, 2003, p. 1044). Various methodological, theoretical, and empirical approaches have highlighted how emotions are part and parcel of social practices of teaching and learning in science learning environments (e.g., Tobin & Llena, 2014). For instance, inquiries into classroom's emotional climate take situated and sociocultural perspectives when studying emotions and as such "overcome the limitations of examining emotions as individual psychological constructs" (Tan, 2013, p. 553) that could naturalize emotions and fixate learning within individuals. Other similar research traditions have examined how emotions are not just passive impulses that happen to us but are "fabrications manufactured and maintained through corporeal and discursive means" (Butler cited in Chubbuck & Zembylas, 2008, p. 279). Drawing on poststructuralist thought, researchers have argued that analyses of emotions from socio-cultural traditions have been limited to micro-processes of interaction without addressing how emotions are discursively and materially constituted and constituting. Focusing on the performative nature of emotions (Zembylas, 2015), responds to calls from within the learning sciences to develop "theories of power, to explain how power circulates in contexts, how it aligns with structural oppression, how it challenges oppression, how it is subtle, and explicit, pervasive, and yet often invisible" (Esmonde & Booker, 2017, p. 2).

Notions of belonging elicit emotional attachments to collectives and imaginaries and are especially relevant when considering institutional practices of exclusion and marginalization within STEM education (Nxumalo & Gitari, 2021). Avraamidou (2019) argued that emotions could be a valuable lens for studying experiences of inequalities and othering and what it means to 'become' a science person in relation to various systems of oppression and recognition. This paper explores the politics of belonging in STEM education contexts by foregrounding emotions as an analytical lens. We demonstrate how political projects of belonging are constructed/resisted *affectively* in two different STEM postsecondary contexts. We examine emotionality in students' lived experiences not only as *reflective* of the "dirty work of boundary maintenance" (Crowley, 1999) but as *constitutive* of how particular collectivities are made to belong. We draw from Sara Ahmed's work who looks at what emotions *do* and less on what they *mean*. A performative view of emotions examines how emotions work "through signs and on bodies to materialize the surfaces and boundaries that are lived as worlds" (Ahmed, 2013, p. 191).

Inspired by Sara Ahmed's various writings including but not limited to the *Cultural Politics of Emotions* (2013), this paper attempts to release belonging from its self-referential associations and positive undertones (sense of belonging and feeling 'at home') to consider the political landscapes of belonging (see also Yuval-Davis, 2006) as they are formed and reformed through daily affects and emotions experienced by Black, Indigenous and People of Colour (BIPOC) in postsecondary STEM programmes. 'Positive' emotions are not necessarily positive, as they might be connected to narrow conceptions of happiness (Ahmed, 2008) and lives of normativity (Berlant, 2011), inherited from within Western, colonial, capitalist, middle class societies. This helps to situate the

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micropolitics (of lived/bodily experiences of racialized bodies) in relation to macropolitics (of racialized and racializing systems) (Mulcahy & Healy, 2021). Political views on belonging allow us to explore how STEM educational contexts extend the "political and affective economies of normativity" with the "production of a collective will to imagine oneself as a solitary agent who can and must live the good life [read also happy life, Ahmed, 2008] promised by capitalist culture" (Berlant, 2011, p. 167). This has particular significance to contexts of postsecondary STEM, that prepare future workers to enter in relationship with the economy and places of labour and livelihood.

Methodology

To explore the corporeal and emotional dimensions of belonging we bring together two data sets; one is from an ethnographic study of a college microbiology laboratory at a Canadian technical college and another data set draws from BIPOC students' responses to an exploratory survey of their experiences in postsecondary STEM university programmes in a university setting in Western Canada. The ethnographic study comes from the first author's doctoral research whereby notions of belonging to Canada via STEM education became salient through her various interactions with international students from India. The other data draws from an exploratory survey of BIPOC students' lived experiences navigating STEM institutional structures, the first author's postdoctoral work alongside the second author. Together, these data sets allow us to view how students' emotions work "to create the very distinction between the inside and the outside" (Ahmed, 2004, p. 28), vis-à-vis STEM as a disciplinary space and STEM as connected to nation-belonging.

Data sources from the ethnographic study included video recordings accompanied by fieldnotes of laboratory practices (e.g., students testing the effect of different products on bacterial growth), semi-structured interviews with the students at the beginning of the course related to their experiences coming from India and living in Canada and ongoing discussions with the instructor about their emerging observations. For the purposes of this paper, we only draw on those data sources to focus on data excerpts where themes of belonging were particularly apparent. For our analysis, we combined thematic coding with collage as a data analysis practice (Morgaine, 2018) involving a juxtaposition of fragments of data, arranging and rearranging them together to enable an analysis of the micropolitics (Bazzul, 2017) of belonging in relation to different scales (to STEM as a belonging to discipline or STEM as belonging to a nation) and in relation to students' actual practices in the lab at the college level alongside students' reflections on their general STEM experiences at the university level. Hence, this study takes a space-sensitive approach to the study of intersecting social relations to examine how "different aspects of belonging such as class (socio-economic), gender and race (body or corporeal aspects), ethnicity, and ethical/political value systems (representative and performative aspects) assemble in certain locations and situations" (Youkhana, 2015, p. 15-16) and how emotions work to constitute and reconstitute those assemblages.

Discussion of findings

Our analysis of the data from the two data sets enabled us to examine political work of belonging being exhibited along two interrelated dimensions: Belonging as having the 'right' kind of body and belonging as emoting in the 'right' kind of way. We present those two dimensions separately to examine how political projects of belonging circulate and are enacted/resisted through bodies and emotions.

Belonging as having the 'right' kind of body

Most of the students in the college microbiology lab were international students from India. In various interviews with students, they discussed their experiences of being channeled into this program by college recruiters and agents back in India as their only entry ticket to Canada. Intersecting with students' ethnic and immigration status, another noteworthy observation was that women formed the majority of students in this lab, constituting 17 out of 18 students. Nived, the instructor, commented how this is not surprising since "most students will become biotechnicians, following protocols". This comment demonstrates how the program extends women as docile and compliant, doing what they are told, by 'following' protocols. In this sense, what it means to have a body in this particular context is configured along racial and gendered lines, reducing bodies to "their working parts" (Kimmerer, 2013, p. 49) through tedious and repetitive lab practices and an overemphasis on performing the 'right' techniques (as was evident through observations of pedagogies of the lab). STEM college programmes along with formal and informal channels of migration contribute to differential valuations of bodies, perpetuating gendered and racialized allocations of labour (Vora, 2015) for Western economic gains. This helps to complicate what it means to belong to STEM beyond acquiring the right bodily dispositions of a biotechnician to consider how learning/belonging in this context are situated within larger gendered, racial, and capitalist formations. We

juxtapose this analysis with an undergraduate student response on a survey describing his experiences of marginalization and discrimination as a South Asian inside a university lab setting:

> Often in science labs, sometimes when paired with people who are Caucasian, I have experienced lab partners who would disregard my physical being and *turn towards other white people* with whom they prefer to talk with. I don't think that was an intentional racist instance, I just have found that often when I am paired with Caucasian males in particular, that they *don't know how to converse with me, want to converse with me or know how to relate to me*. Feel somewhat lesser than them.

In this case, we witness how practices of exclusion take place through bodily orientations that reinforce the idea that to belong to the lab, one needs to have the 'right' kind of body (in this case, a Caucasian male body). Those self-reflective and narrated experiences of marginalization could be equated with the subtle and pervasive practices of inclusion/exclusion, evident in the context of the college microbiology lab. These analytic examples gesture at how material places (the college lab vs. the university lab) intersects with social relations to produce the ways that belonging to STEM is encountered/experienced. They both center belonging through corporeality as particular instances of having the right kind of body in STEM places, though each data segment is more nuanced in how different STEM bodies become constituted as 'less'; this might happen in the moment (in transient bodily orientations of turning towards/ away) or in more pervasive and infrastructural arrangements (with the prevalence of particular bodies in specific places).

Belonging as "emoting in the right kind of way"

When students were working in the lab, they often turned to each other or to their instructor to discuss their plans for working and living in Canada. Hence, accompanying their ordinary lab practices, appears to be a spectral presence (with its associated fears, anticipation, anxieties, and hope) of wanting to belong with Canada through their labour in STEM. Such 'positive' and hopeful outlooks for the future work to further normalize precarious conditions (Veldstra, 2020) faced by international students as they experience their belonging to Canada. Asked to project themselves five years into the future, many mentioned having emotional and financial stability in Canada:

> Anushka: After 5 years, either I am working in my pharmaceutical industry, or I will clear my pharmacy test and become a pharmacist here, *I don't want to go back to India.* In between I will get married and have 2 babies. I just need the perfect husband for me.
> Nisha (jokingly): Don't worry, we will *find a Canadian husband* for you.

Careful not to downplay international students' visceral dreams and hopes for a better future, for Anushka, STEM was a pathway for belonging to Canada. However, becomes quickly gendered and racialized through becoming a wife to a "Canadian" man and mother. Juxtaposing the positive with the negative, emoting "wrongly" works to reproduce exclusionary boundaries, as evident in a student's response in the survey data:

> I am constantly seen as *an angry person when I am outspoken about my mistreatment*. Sometimes it feels as though my value is to entertain white folks in STEM, something to make fun of, something to tokenize.

This student self-identifies as Korean and, in this statement, we could see how anger turns to a technology of racism (Zembylas, 2015) that produces bodies in opposition to other 'composed' bodies, the white folks in STEM. But also, anger serves to disturb and challenge the "ordinary affects of racialization" (Mulcahy & Healy, 2021). Being an angry person is likened to a "kill-joy" (Ahmed, 2008), someone who disturbs belonging to/of whiteness in STEM education contexts. Reading students' practices in the microbiology lab alongside students' responses to the survey, we notice how students in STEM "acquire certain subject positions based on regulatory norms of social and political affect" (Zembylas, 2016, p. 206), that delimit/resist imaginaries of belonging at multiple intersecting scales, spaces of STEM education and Canada.

Conclusion and implications

Attending to the *work* of emotions enables an appreciation of how constructs of belonging conceal non-innocent relations with possible implications for justice-oriented efforts in STEM education. Our study also showed the possible merits in analytically attending to the affective and corporeal aspects of belonging within situated practices and discourses in STEM contexts to examine how micro-meso-and macro levels of analysis are co-

constituted (Philip & Gupta, 2020) and to better highlight and along with that, imagine pedagogical possibilities within microlevel interactions, where agentic individuals "improvise with ideologies and practices that may otherwise appear static and inevitable" (p. 196). This is an area that we hope to keep expanding on. Our analysis also showed how a multi-scalar analysis of bodies and emotions in relation to various spaces and various social relations might reveal more layered understandings of how bodies become distributed/valued within STEM fields.

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