


Borders, gender, and performative contradictions in active learning

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We present some ongoing (under review) work to conceptualize gender in mathematics education using a radically different approach: though an intersection of Nail's border theory, performative new materialism, and elements of Hegelian philosophy (as set forth by Marx and Žižek). Through this approach, gender is conceptualized as a border between the masculine and feminine, and for some, this is a border to be crossed. In response to researchers' call to elucidate the meaning of gender (e.g., Damarin & Erchick, 2010), the approach discussed here claims that much of gender's influence is lost on researchers due to overlooking the reflex-category nature of the masculine and feminine in performance. Metaphors of immigration/emigration, power differentials, and performativity are discussed apropos of participation in mathematics.

A gender problem in mathematics education and active learning

Active learning continues to spread its grasp on education fields as a “panacea” for mathematics and STEM education, with more and more literature being published that posit its beneficial universality for students. For instance, Freeman et al. (2014) found that the active learning environment (ALE) leads to “increases in achievement [...] across all of the STEM disciplines and [these increases] occur in all class sizes, course types, and course levels” (p. 8412). In another study, Theobald et al. (2020) found that ALE is “disproportionately beneficial [...] for underrepresented minority students” (p. 6478). Similarly, Laursen et al. (2014) found that ALE “levels the playing field” for men and women in terms of achievement. These large, widely-published studies clearly herald the trend in mathematics education towards seeing ALE as beneficial for all students, and even perhaps more beneficial for those who may need it the most.

However, the last decade has concurrently seen a confusing emergence of literature claiming that ALE impacts different groups of students in different ways, not always resulting in content gains or increased achievement. For example, Johnson et al. (2020) found that men outperformed women in a type of ALE called Inquiry-Oriented Instruction. In their study, ALE had no negative effect on the women, but rather it had no effect at all. Meanwhile, the men experienced content gains as a result of the ALE intervention. Compared to national representative samples that show no gender difference in student performance (with,

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presumably, data obtained from a traditional instructional environment), the results of Johnson and colleagues' study lead to a troubling contradiction. Their work mirrors the findings of Bando and colleagues' (2019) large-scale study, which found that a gender performance gap was exacerbated by ALE interventions, and, alarmingly, *increased* the longer that the intervention was being employed.

Gender-as-border: Towards a new theory of performative identity

These contradictory results have led an increasing number of scholars, including us, to ask "why," and to question the claim that ALE is indeed a universal panacea. While it is possible that the studies were not conducted in the same way, their overall claims apropos of gender are universal ones, and thus we approach our work from a position of troubling that universality. This paper reports on a larger, in-process theoretical development that attempts to re-examine these contradictions through a theoretical intersection of borders, gender performativity, and Hegel-Marx reflex categories.

Borders

Thomas Nail's (2016) border theory has emerged recently as a promising new contribution to the field of philosophy. Nail's work centres on motion and movement, and as such, his work on border theory is also highly dynamic. Borders, as mechanisms of social regulation, divide spaces and create their own unique ontological presence (cf. an ontological lack) as the divider itself. He describes two types of borders: extensive and intensive. *Extensive* borders create an "absolute break—producing... discontinuous entities" (Nail, 2016, p. 3); *intensive* borders create "new path[s] [...] qualitative[ly] chang[ing] [...] the whole continuous system" (p. 3). Consider that the masculine and feminine are historically constructed as an extensive border system. They are seen as quantitatively different, exemplified by the typical options on standard forms to check a box next to "male" or "female," as if they are mutually exclusive categories. We argue that, because of this extensive historical construction, "gender" leads to contradictions of many types—e.g., the current conflicts over transgender ontology—that could potentially be addressed via an intensive conception. Of particular interest here is the implications this impasse creates apropos of participation in mathematics classrooms.

Performance

Within the new materialist tradition can be found several variants, one of which is performative (Gamble et al., 2019). In this paradigm, the material real is a stage on which performances are made by actors: as such, ontology and epistemology are "inherently complicated and mutually constituting [of each other]" (p. 122), becoming one understanding of an *ontoeπισtemology* that, further, "problematize[s] anthropocentric binaries" (p. 111) such as gender. A key consequence of this perspective is that "humans can therefore never observe the universe as though from outside it [...] [and thus, being bound by the] material configuration of the world [...] [necessarily] leads to a thoroughly 'performative' and relational

materialism” (p. 123). This perspective allows gender to be seen as a performance of students as actors engaged in the performative role of producing themselves and their identities through the labour of their performance—a performance which, crucially, is political (cf. Butler, 1990; Moore, 2020). The politics of one’s performance of gender is realized in the material real through the dynamics of Hegelian and Marxian power relations.

Hegel/Marx

Hegel (1807/1977), in one section of the *Phenomenology*, develops the notion of power dynamics between two self-consciousnesses in relation to each other by using the metaphor of lord and bondsman; the former is self-consciousness for itself and the latter is self-consciousness for another. The bondsman, in performing the lord’s labour on the world of things (viz. the material world) reverses his subordinate position to become fully self-aware *through his labour*. The lord merely takes the enjoyment of the bondsman’s labour *qua* the products of the world of things without becoming self-aware of his position as lord *vis-à-vis* recognition of the bondsman *as such*. The bondsman becomes ironically and symbolically free *vis-à-vis* the self-awareness he acquires in the act of labouring—labour imposed on him by the lord—that forces him to recognize the lord *as such*. Thus, Hegel shows that in being-for-another (viz. the bondsman), one transcends into a “more fully being-for-self” role. Hegel called this reflexive identity a reflex-category: the bondsman would not be a bondsman without the lord, and the lord would not be a lord without the bondsman, however neither is what the other sees himself as. This was later further developed by Marx: “[O]ne man is king only because other men stand in the relation of subjects to him. They, on the contrary, imagine that they are subjects because he is king” (Marx, 1867/1887, Footnote 22, p. 55, as cited in Žižek, 1989/2008, p. 20). Marx’s symmetry here is homologous to Hegel’s argument dialectically.

Consequences in the mathematics classroom

Combining all the above theory allows us to re-envision gender as a performative dimension in the classroom, a dimension which, crucially, conflicts with ALE. The Hegel-Marx axis gives us the power dynamics of masculine (lord) and feminine (bondsman), as co-constituted and reflexively determined, the source of our current gender impasse. Evidence of the extensive gender border, as the historical determination of gender’s construction that we observe in modernity, can be found in such phenomena as women’s suffrage, the gender pay gap, maternity leave and benefits, and the disproportionate ratio of women to men in professional roles. Nail’s border theory describes how the division between them functions and describes the ontoepistemological “stage” over which students must perform their gender in the material real of the classroom. In both the active learning and lecture environments, the teacher takes the masculine position, and the students assume the feminine: “The teacher *knows for* the students, and the students—relegated to performing the teacher’s labor—merely *work on it*” (Moore & Johnson, under review). However, in the ALE case, a split occurs: the teacher transfers some of her power onto the students in the form of

ALE tasks and expectations. When this occurs, the men and boys take the assertive voice, which is championed in ALE, whereas the women and girls are emburdened with the task of “emigrating”—leaving their feminine home and enacting a gender performance across the border to the masculine side—if they want to be successful. Crucially, the boys in lecture do not need to reciprocate this. Our goal with this project presentation is to discuss our theoretical development and its implications.

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