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The sociopolitical turn in mathematics education and decolonial theory

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Abstract

This literature review examines how the theoretical perspectives aligned to the sociopolitical turn in mathematics inform social justice mathematics education. While existing literature has established the importance of social justice frameworks informed by critical theory, there has been limited exploration of critical race theory, poststructuralism and feminist theory, perspectives that offer a broader and more complex understanding of the social and political. After examining how these perspectives contribute to social justice mathematics, we explore the potential contributions of decolonial theory, particularly the way it unsettles accepted notions of social justice. By drawing and building on the sociopolitical turn in mathematics education, this article argues that decolonial thought can also assist in reimagining social justice mathematics education theoretically,

methodologically and pedagogically. Ultimately, the article argues that there is no social justice without cognitive/epistemic and ontological justice, meaning that social justice loses ethical and political weight when modernity's violent epistemic and ontological foundations are not questioned by social justice mathematics education research.

Keywords sociopolitical turn; social justice; epistemic justice; mathematics education; decolonial theory; coloniality

Introduction

Unlike other fields in education, mathematics education research centred on social justice is relatively new. In his well-cited article 'The sociopolitical turn in mathematics education', Gutiérrez (2013) argued that research in mathematics education had only recently begun to adopt social, cultural and political theoretical perspectives to examine educational issues related to equity, power and identity. This emerging interest took place within the US context of No Child Left Behind, standardised testing and the constant push to adopt ostensibly innovative pedagogy and concepts in mathematics education. These top-down efforts slowed down the development of social justice mathematics (SJM) and its critical interrogation of why mathematics should be learned, why it offers social capital and how identity and power are constructed vis-à-vis mathematics. Despite this context, researchers began to advance sociocultural and sociopolitical perspectives in mathematics education (Goldberg et al., 2023). Gutiérrez (2013: 37–8) rightly pointed out this critical moment, suggesting that 'we are at a moment in history where we have ready excuses not to attend to issues of identity and power in mathematics education – after all, what does power have to do with a rational, universal field like mathematics?' She argued that the sociocultural understandings of equity research in mathematics tended to underscore superficial notions of equality, thereby eliding issues of identity, power and social justice. With a limited view of equity, mathematics education research increasingly examined teaching and learning within specific contexts through a sociocultural perspective. Through this lens, the individual's cognitive abilities were no longer the primary focus; rather, research situated teachers and students within the sociocultural contexts in which they make meaning on an everyday level. While sociocultural perspectives made important contributions in unsettling behaviourist and cognitive approaches, this type of education research underemphasised power relations.

These shortcomings led some researchers, including Gutiérrez (2013), to adopt critical, anti-racist and social justice perspectives and approaches in their work to centre the discussion of identity, namely the asymmetrical power relations intimately tied to racialised and gendered subject positions. Departing from superficial notions of equity advanced by sociocultural perspectives and their elision of issues of power, identity and social justice enabled some researchers to centre the voices of historically excluded students and to interrogate the power imbalances that students resist within and beyond schools. Gutiérrez (2013) proposed an epistemological and methodological shift towards a more radical examination of the sociopolitical, a necessary turn offering researchers, teachers and students the analytical concepts to inquire how power and authority are reproduced or unsettled through mathematics. On a cultural level, this sociopolitical turn disrupts the dominant construct that identities are static and singular, rather than dynamic, plural and always already entangled in a field of power relations. Critical perspectives have henceforth offered researchers, teachers and students new ways to intersect mathematics education with broader social justice efforts. Taking Gutiérrez's (2013) sociopolitical turn as a point of departure, this article reviews the theoretical perspectives shaping SJM education since 2013, mapping out the varying ways in which SJM is conceptualised and implemented.

This study draws on Sant's (2019) theoretical review to identify, describe and critically appraise the theoretical lenses informing SJM education research. We initiated the literature review by situating the context in which SJM education emerged. Further, we situated our literature review within English-speaking contexts, with particular attention to the United States. We used EBSCO (Education Source), SCOPUS and ERIC databases to search for the following terms: mathematics and social justice. Several criteria of exclusion and inclusion were used to limit the review parameters (abstract, focus, language and accessibility). We analysed and categorised articles according to their epistemological commitments to map out conceptual distinctions, and the varying ways the literature conceptualises

SJM. To complement this literature review with the ways in which decolonial theory informs mathematics education, we drew on research found at the intersections of coloniality and mathematics that question modernity's dualist epistemological and ontological foundations.

In the following section, we review the salient SJM literature, focusing on four key perspectives: critical theory; critical race theory (CRT); poststructuralism; and feminist theory. We integrate the emerging literature informed by decolonial theory to examine how SJM may unintentionally reproduce what it seeks to unsettle. We gesture towards a decolonial turn in mathematics education research that complements the sociopolitical turn by unsettling conventional understandings of social justice, inviting scholars to challenge the ontological and epistemological foundations of Eurocentric mathematics. In the conclusion, we summarise key arguments.

Reviewing the complementarity between different theoretical discourses in SJM

As noted above, Gutiérrez (2013) outlines the emerging social justice-oriented frameworks in the field of mathematics education research. According to her, there are three important theories increasingly shaping the field. The first is critical theory, which is consolidated as the subfield of critical mathematics education that focuses on consciousness-raising and action. Here, critical pedagogy stands out as a salient field that has heavily drawn on Marxist perspectives, the Frankfurt School and Paulo Freire's (1970) philosophy of education. Critical pedagogy aims to question power imbalances, and it emphasises the role that education and collective action can play in dismantling oppression. One could make the argument that this perspective is more interested in relations of power constituted by the division of labour and class-based stratification within the context of capitalist exploitation. The second and third theoretical perspectives are CRT and poststructuralism, which extend analyses and critiques beyond class, recognising how class cannot be easily detached from race and gender. Below, we detail critical mathematics education, and complement it with the varying critiques and contributions made by CRT and poststructuralism, while also discussing how feminist theory and decolonial theory move the field of mathematics education forward.

Critical theory and SJM

Having reviewed a range of relevant articles, we encountered multiple pieces informed by critical theory that offer diverse definitions of SJM. Among these, researchers interchangeably employ terms such as SJM, critical mathematics and teaching mathematics for social justice (TMSJ). Below, we outline the central themes that emerged from the literature, and elaborate on their significance for the epistemology of critical mathematics.

Research on critical mathematics education has identified significant themes highlighting the role of SJM in supporting students' development of *conscientização* (critical consciousness) and fostering sociocultural identities and political subjectivities. Critical mathematics education also encourages action against social injustices, nurtures a sense of agency and promotes mathematical inquiry that deepens learners' understanding of sociocultural and political-economic contexts (see, for example, Ataide Pinheiro, 2022; Felton-Koestler, 2017, 2019; Rankin et al., 2021; Register et al., 2022; Wright, 2016, 2021). Another crucial aspect of the epistemology of critical mathematics education concerns the definition of teaching for social justice. In particular, TMSJ aims to facilitate mathematical investigations that empower learners to engage in social action, underscore the cultural dimensions of mathematics and employ mathematics to challenge social structures (Felton-Koestler, 2017; Wright, 2021). The pedagogical approach emphasised in TMSJ embodies a dialogical relationship between the teacher, student, curriculum and context (Rankin et al., 2021). This teaching philosophy and methodology encompasses collaborative, discursive and problem-posing pedagogies that actively involve all learners and integrate their real-life experiences (Felton-Koestler, 2019; Rankin et al., 2021; Wright, 2016, 2021).

Kokka (2022) builds on the two major goals defined by Gutstein's (2006) work to introduce a third goal to critical mathematics education: the inclusion of affective pedagogical goals. Gutstein (2006) had previously advanced two fundamental goals to envision mathematics as a tool for comprehending social issues and effecting social transformation. The first goal was to read the world with mathematics, that is, to interrogate power dynamics, inequalities and discrimination. The second goal was to write the world

through mathematics, which entails using mathematics to enact social change. Gutstein's (2006: 61) work highlights the importance of justifying arguments by analysing issues mathematically and questioning dominant assumptions, leading to improved mathematical understanding and a 'collective sense of justice' among students. Kokka's affective pedagogical goal centres students' emotions, attitudes and beliefs regarding dominant mathematics, social inequities, and the emotional journey involved in taking action against injustice.

The aforementioned literature heavily engages with the concept of critical education to achieve social justice outcomes. However, this approach falls short of comprehensively exploring crucial aspects such as race, gender and sexuality in mathematics. While a few authors briefly touch on factors such as race, gender, sexuality, agency and marginalised identities, these elements are not thoroughly developed within their discussions, thereby limiting SJM to class-based analyses and interpretations within the context of capitalist exploitation. To address this gap, in the following sections, we delve into the varying ways in which other theories inform SJM.

CRT and SJM

Although education researchers in other fields of study have interrogated structural and institutional racism by drawing on CRT, LatCrit, TribalCrit and critical Whiteness studies, among others, mathematics education researchers have fallen behind these sociopolitical lenses that seek to unsettle systems of domination and exploitation linked to the social construction of race and the structural and institutional arrangements of racism. In this section, we view CRT as a theoretical framework crafted by US critical legal scholars to examine the intersections of race and racism with social, cultural, political, economic and legal structures. Within the scope of CRT, scholars from diverse backgrounds, including Asian, Latinx, Indigenous and Queer scholars, have broadened their application to scrutinise issues related to race, immigration, Indigenous peoples' rights and Queerness. This expansion has given rise to additional theoretical frameworks under the CRT umbrella, such as AsianCrit, LatCrit, TribalCrit and QueerCrit (Delgado and Stefancic, 2017). Concepts such as intersectionality assist in bridging the analysis and critique of class, race, gender and sexuality, categories that are increasingly being used in SJM, as addressed below.

Before Gutiérrez's (2013) publication, the literature is sparse in terms of explicitly analysing and implementing SJM through a CRT lens. To a point, it seems that interrogations of race have been completely absent, despite the initial intentions of a social justice framework. There is, nonetheless, an emerging scholarship drawing on CRT in mathematics education that is explicit in its social justice aims, albeit without having to situate the scholarship within the SJM field, since CRT is already undergirded by theoretical and political commitments that interrogate systemic oppression and social inequities. Larnell et al. (2016) use CRT to expose blind spots in SJM academic research in the hope that exposure will lead to addressing racial inequity and the role mathematics can play in terms of exacerbating or improving it. By using this lens, they elucidate specifically how SJM is disrupting or maintaining institutional racism, and whether it is addressing the goals it was designed to address (Larnell et al., 2016). They suggest that social justice needs to be intersected with other social injustices to reflect the complexity of reality (for example, the intersection of environmental justice and food access with racism). Larnell et al. (2016) invite researchers to use CRT to identify conflicts between SJM that are institutionally and structurally directed and SJM tasks that relate to pedagogical decisions based on personal beliefs of justice. These are not mutually exclusive, yet it is important to analytically distinguish them, since they do have very real material and political consequences if the former is disregarded.

Taking a structural and materialist lens, Davis (2019) examines the intersection of mathematics education, property rights and CRT, aiming to explore how property rights and CRT contribute to reducing social and educational inequities, particularly within mathematics education. Davis (2019) puts forth several tenets within CRT and mathematics education, which we paraphrase as follows:

(1) The United States, including its schools, mathematics curriculum and structures, is built on the foundation of racism and Whiteness as property (Harris, 1993)
(2) CRT questions the idea that Black adults and students alone are responsible for their communities, families, schooling and mathematics education
(3) CRT focuses on the intersectionality faced by Black adults and students in everyday mathematics classrooms

(4) CRT uses multiple approaches to fully grasp Black adults' and students' experiences concerning racism, sexism and classism, namely how it relates to their mathematical experiences within and beyond schools
(5) CRT aims to attain freedom and social justice for Black adults and students in all settings.

Further, Davis suggests a roadmap for using CRT in mathematics education, which involves the use of counter-narratives, examination of educational resources as intellectual property, acknowledgement of inherited Whiteness regarding intellectual production, identification of common interests in liberatory and social justice struggles within and beyond schools, and the pursuit of concrete social justice outcomes. However, this approach proves most effective only when stakeholders engage with it through a sociopolitical, historical, structural and critical understanding of anti-Blackness within mathematical spaces, as opposed to liberal notions of individualised racism supported by colourblind ideologies.

Anderson (2019) also employs CRT to examine the impact of racism through the analytic of racial tax. This concept encompasses the absence of learning opportunities in mathematics as one form of taxation, the deficiency of quality instructors as an intergenerational tax, and the presence of colourblind accountability discourse as a structural mechanism perpetuating racial taxation. Anderson's (2019) perspective aligns with Davis's (2019), differing, however, in the belief that only stakeholders, even those who comprehend the lived experiences of Black individuals, can generate a sustainable outcome capable of overcoming the broader institutionalised racial taxation.

As evidenced in the works discussed above, CRT articles have predominantly (and rightly) focused on Black people's experiences. However, there is a risk in portraying racism in binary terms, at least in SJM research drawing on CRT. There is emerging research (Miles et al., 2019; Zavala, 2014) drawing on TribalCrit and LatCrit that will contribute to this discussion insofar as it sheds light on other racialised experiences, while also linking these experiences to anti-Black racism. Since there is a paucity of research that draws on CRT or its other branches (LatCrit, TribalCrit and AsianCrit), there is a pressing necessity for comprehensive investigations encompassing various groups. Research in CRT and mathematics must situate racism within a heterogeneously configured structure to effectively promote SJM.

Poststructuralism and SJM

While mathematics education research oriented towards social justice (although not using SJM per se) is more familiar with critical theory, poststructural perspectives have not received sufficient attention. A poststructural lens enables researchers, teachers and students to consider how discourses shape meaning-making practices and world views, namely those related to the understanding of mathematics. The dominant episteme, in other words, shapes the discourses we uphold and the meanings we give to our everyday practices, including our naturalised understanding of mathematics. Feminist poststructural perspectives informed by Harding's (1991) and Haraway's (1988) work have contributed to unsettling the naturalised and universal conceptions of mathematics, as well as science and technology studies.

Other poststructural work, such as that by Walshaw (2013), Lutovac and Kaasila (2018) and Chronaki and Kollosche (2019), has investigated identities in relation to the practice of mathematics, and their implications in the fight for social justice. Walshaw (2013) advances SJM research by deepening the understanding of poststructuralist concepts of power dynamics and identity construction. She challenges the traditional notion of fixed identities by proposing that identities are multilayered, fluid and socially constructed. Static notions of class, gender and ethnicity fail to capture the complexity of individuals' experiences, and how these identities are negotiated through discursive and social practices. Walshaw's (2013) work unveils mathematics education, classroom norms, materials and discourses as embedded in a social web of power intimately related to identity, educational practices and structures that create oppressive conditions that shape the experiences of students and educators. To deconstruct this web of oppression, individuals must uncover and challenge the power dynamics inherent in educational settings.

Lutovac and Kaasila (2018) examine theoretical perspectives of research that explore mathematics-related teacher identity. They argue that identity is first constructed through discourses, power dynamics and societal norms. Identities are therefore inherently fragmented, multifaceted and contingent. Second, these unwritten rules shape reality, possibilities and limits of social existence. Third, critical reflection and the use of personal narratives can bring awareness to contextual elements of identity formation. The authors reveal that sociocultural and poststructural approaches highlight discourses, social practices and structures, but lack attention to individual experiences.

Chronaki and Kollosche (2019) analyse the application of poststructuralist discourse analysis to the study of identity within the context of mathematics education. Their research highlights the function of nodal points, which are the centre of meaning creation, and which shape discourses. Additionally, traditional and essentialist notions of fixed meanings and objective truths are rejected. The researchers conclude that discourse and classroom practice can be negotiated between students and teachers, which allows for the reorganisation of mathematics education. This shift can influence how students interact with mathematics and can liberate them from a prescribed, hegemonic idea of identity.

Poststructuralism, as exemplified by the works discussed in this section, brings attention to the intricate relationship between discourse, power and identity construction in mathematics education. In essence, applying poststructural perspectives challenges traditional paradigms, and invites researchers, educators and students to critically engage with the intricate interplay between discourses, power dynamics and identity construction in the pursuit of more equitable mathematics education.

Feminist theory and SJM

The previous discussion on poststructuralism and the concepts of power dynamics and identity construction is also examined through a feminist lens. Poststructural and feminist studies show how power operates through gender, and how asymmetrical relations produce power structures that are unquestioningly accepted and normalised. This acceptance happens not only because gender power dynamics are taken at face value, but also because the language used in everyday interactions reinforces and normalises existing power structures. Through the production of meaning, and as a way of expressing ideas about the self and identity, language evolves into discursive practices carrying underlying assumptions and cultural frameworks that shape individual and social reality. Similar to the idea of intersectionality (Collins and Bilge, 2020), Przybyla-Kuchek (2021) posits that the human subject is a product of a complex and contradictory system of discursive practices that denies a true self because a subject is always becoming and fragmented into multiple discourses that present numerous positions and roles. Ferguson (2017: 271) adds that 'we are not born, but rather we become, women'. There is also the possibility of contradictory roles, or roles that are not a choice but an imposition that can even be multifaceted. One must be wary, however, that the category of woman is not universalised to ignore the power differentials of colonised and negatively racialised women.

Meaning is created by the choice of words, the context, the cultural background and the ambiguity of the language. This requires an examination of power within gendered language, because it is in this relationship that discourses are organised and regulated to create binaries and hierarchies. At this point, it is significant to highlight Harding's (1991) idea that the term 'feminism' is a contested zone, since different feminist theories exist (for example, radical feminism, liberal feminism, anarchist feminism, Jewish feminism, lesbian and gay feminism, Third World feminism, Black feminism and decolonial feminism). Despite some differences, Ferguson (2017) reminds us that all feminist theories are consistently suspicious of dualistic thinking, because it simplifies a complex field and generates hierarchies that naturalise prevailing power relationships and makes them more difficult to challenge.

How do feminism and mathematics intersect? Ferguson (2017) celebrates the fact that intersectionality – one of the greatest accomplishments of Black feminist theory – interdisciplinarity, and the cultivation of theory/practice feedback loops put feminists in critical conversations with political projects and struggles. In response to our previous concern about the need for reimagining SJM education theoretically, methodologically and pedagogically, McGuire (McGuire, 2021: 2761) posits that 'the field of mathematics education offers the most significant progress in linking feminist theories found in STS [Science and Technology Studies] and mathematics'. Feminist theory can therefore support the reimagination of SJM by informing and providing concepts for analysing entangled relationships between complex social issues, mathematics and pedagogical practice. Here, the idea is to encourage critical dialogue in mathematics courses, and to include unseen types of diversity, such as economic, intellectual and political differences. Most importantly, 'feminist research and theory, instead, questions science and mathematics as fields of inquiry that rely on particular (and limited) ways of knowing, especially in terms of how their imbued assumptions of neutrality and objectivity reinforce the patriarchy' (Rubel et al., 2022: 232). It also makes evident that mathematics curricula do not sufficiently take up girls' and women's experiences, potential and ways of knowing. Moreover, feminist research in mathematics education insists that an intersectional approach understands gender as one social system that interlocks with other social systems, such as capitalism, racism and heteropatriarchy. Despite the

invaluable contributions to interrogating entwined categories, the dominant tendency within certain strands of feminist thought is an absence of a serious and sustained critique of the colonial foundations of these categories. In the next section, we discuss how decolonial theory unsettles certain assumptions related to social justice and, at the same time, potentially complements the reviewed theory informing SJM education.

Gesturing towards a decolonial turn in mathematics education

> STEM [science, technology, engineering and mathematics] without appropriate political education is equally an instrument of advancing imperialistic aggression compared to humanities. (abiyot, 2023)

Decolonial theory is an emerging perspective informing SJM (for example, out of 28 publications, 27 have been published since 2020). This emerging field, which is referred to by some scholars as decolonial mathematics education (le Roux and Swanson, 2021), situates knowledge historically and discursively. Situating mathematics within colonial contexts dependent on dominant knowledge production includes interrogating dualist and linear perspectives. Like the previously discussed perspectives, decolonial mathematics education questions issues of race, gender, class, ethnicity and power, yet adds to them by interrogating the coloniality of these categories. It seeks to obtain epistemic validation regarding other ways of knowing and being vis-à-vis mathematics, namely, if validation is found within sites of struggle aiming to construct liberatory and culturally and epistemologically affirming practices (Bhattacharya et al., 2021).

Given the emerging interests in decoloniality within the field of social justice-oriented approaches to mathematics, we discuss some key theoretical contributions that decolonial theory offers SJM. Questions considered (among others) are the following: Can there be social justice without questioning modernity/coloniality? What frame of reference does the former depend on, and what does the latter reveal about mathematics as we expand the scope of the 'social' towards a planetary frame of reference (Fúnez-Flores, 2023a, 2023b, 2023c)? From the literature drawing on decolonial theory, we learn that mathematics education has been subordinated to scientific-oriented mathematics, a form of universalised mathematical description and representation that sustains a Eurocentric world view. This world view involves an ideological discourse and a point of reference from which other ontological assumptions about the world and their concomitant world-making practices are deemed inferior (Flores and Kerscher Franco, 2022; Fúnez-Flores et al., 2022a, 2022b).

A decolonial stance within mathematics education problematises the naturalisation and universalisation of mathematical knowledge, as well as the teaching of mathematics, including the entangled relationship of mathematics with, and complicity in, imperial/colonial projects, as the epigraph of this section clearly expresses. Lowe and Manjapra (2019: 30) illustrate how colonial projects in the past depended on mathematically organised plantations, understood as 'managed landscapes that facilitated measurement and calculation. Colonial capitalists organised plantations according to a regime of visuality … a rectilinear axial system, on which humans, animals, plants, and ecologies could be identified, surveilled, disciplined, moved, and measured'. The climate catastrophe in Maui, intimately linked to ongoing colonial dispossession and ecological destruction, clearly demonstrates the concrete consequences of logico-mathematical reasoning that is detached from the reality of Indigenous peoples, which is solely used to conquer nature and further dispossess and accumulate capital. One could also extend this analysis to the effective control of borders and spaces in Palestine that concentrates and divides peoples in enclaves in the occupied territories, displaces and dispossesses Indigenous peoples, and reproduces the eco-coloniality and environmental warfare responsible for the destruction of Palestinians' ability to sustain life (Molavi, 2024). The colonisation of space is inconceivable without the instrumental rationality to which mathematics is linked. Decolonial modes of thinking about mathematics thus require making visible how mathematical knowledge is expressed in ways that are not tied to systems of domination and exploitation. This also requires pointing to practical applications situated in communities resisting the concrete impacts of coloniality, understood as the discourses, practices, racial classifications, racialised division of labour, institutions, intersubjective relations and cultural-epistemic dependency that saturate all spheres of social existence, including mathematics education.

Perhaps one of the clearest explanations of decoloniality within mathematics is developed by Baker (2022: 245), who poses critical questions that get at the ontological assumptions informing Eurocentric mathematics:

> What are the cultural relations between mathematics, technics, and the making of particular kinds of worlds? How are different cultural-civilizational traditions of mathematics and technics related to different ways of knowing and being involved in the ordering of worlds? How has modern Western mathematics participated in the metaphysical framework responsible for producing instrumental knowledge of nature and enabling technical ways of making the world modern?

These questions, and the philosophical discussion advanced by Baker (2022), invite us to distinguish between technic, understood as the poiesis that is integral to all cultures, and technology, understood as the instrumental rationalisation of technics designed to dominate and exploit nature via dominant modes of knowledge production linked to capitalist exploitation and colonial domination.

If SJM education research does not question, in the first instance, how mathematics shapes technology, and how the latter is linked to systems of oppression and exploitation, it may reproduce what it is trying to unsettle. We make this claim because any formulation of social justice that does not seriously question the epistemological and ontological foundations of capitalist modernity/coloniality, and its dependence on technological innovations linked to ecologically destructive modes of extraction and exploitation (that is, eco-coloniality), is insufficient. SJM may potentially become complicit in reproducing domination when nation state-centred frameworks hide from view the colonial relations one country has with another. It is not enough, in other words, for more people of colour to participate in mathematics to alleviate social injustices within the boundaries established by the nation state while leaving the material consequences in the Global South unexamined, not to mention the elision of the settler colonial or internal colonial dynamics within each nation state.

Better representation in mathematics in one region can easily have devastating consequences in other regions. Take, for instance, the US$90 million contract that Howard University received in 2023 from the US Department of Defense, which reveals the very real danger of 'diversifying' those who can create technologies of violence that are produced by universities (Bailer, 2023). This further unveils that the university does not only discursively justify coloniality; it also reproduces weapons used to displace people elsewhere. In the case of Howard University, more Black and Brown people will be involved in imperial/colonial projects of dispossession, while creating the illusion of democratic representation in STEM fields. As Secretary of Defense Lloyd Austin III claims, 'Today as we work to build enduring advantages for our brave men and women in uniform, we must seek the latest innovations in science and in engineering. That means building more bridges to America's outstanding STEM community' (Bailer, 2023: n.p.). From a decolonial perspective, one can easily see how coloniality is reproduced, as those on the receiving end of domination are democratically included in imperialism's global project of death and destruction. We posit that social justice frameworks that refuse to interrogate these planetary processes and entanglements are complicit in their silence. What is the meaning of social justice if past and present colonial realities within and beyond the nation state are ignored? What is social justice without an entangled or relational understanding of colonial structures, institutions and processes?

The field of mathematics education research, when informed by social justice paradigms, will contradict their intended purpose unless it challenges the technologies of violence to which mathematics education and STEM fields collectively contribute (Tabar and Desai, 2017). If modernity's dualist ontology is not also disrupted, how then could SJM education, curriculum, pedagogy and research claim to interrogate coloniality and the structural, social and institutional problems resulting from Eurocentric world views that ontologically bifurcate culture from nature? Modern naturalism depends on the mathematics of nature and the geometry of space (Baker, 2022), which not only justifies the existence of one true reality independent of one's cultural participation in it, but also actively reproduces domination through technological innovations linked to capitalist exploitation and colonial dispossession. It is imperative to disrupt the naturalisation and reproduction of the type of knowledge created and maintained by Eurocentric rationalities that 'formulate universal principles of classification and judgment dictating what can be seen, felt, spoken, and thought – an operation of the coloniality of power, knowing, being, and life that pretends to universalize ideas in the form of a discourse that is no more than a subjectivation' presented as absolute truth (Flores and Kerscher Franco, 2022: 48).

It is a necessary task to unveil how social justice-oriented approaches and frameworks in mathematics buttress the modern/colonial capitalist order when they do not sufficiently contest technologies of colonial violence. It is equally important to make more visible the emerging practices that point to pluriversal ways of engaging mathematics, not as an end in itself, but as a means to create a world otherwise – a world where mathematical knowledge, among other knowledges, is no longer linked to power, and to colonialism's calculated project of dispossession and subjugation. Decolonial mathematics education is thus not only about epistemic justice; its aim is ontological insofar as alternative world-making practices are at the heart of pluriversality and decoloniality (Fúnez-Flores, 2020, 2021, 2022; Savransky, 2017).

Advancing social justice in mathematics education requires decolonial thinking and doing. Unsettling the Eurocentric epistemology undergirding mathematics entails an engagement in a geopolitically reflective stance, assuming an attitude of insubordination towards discourses perpetuating multiple forms of domination. Ethnomathematics, for instance, is a counter-hegemonic movement that allows the possibility of thinking and doing mathematics otherwise (de França and Mendes, 2020). It is a decolonial response that refocuses the doing and thinking about mathematics for a meaningful and situated practice that acknowledges the silenced voices, and leverages them against dominant scientific approaches to mathematics (Rodríguez, 2021).

Due to space limitations, we will not discuss all the examples that demonstrate how communities resist dominant ways of thinking and doing mathematics. It will suffice to invite SJM researchers to learn from what is being advanced from below and from the Global South, as well as from the Global Majority. Some communities, including the Guaraní and Kaiowá in Brazil, have reclaimed their positions as mathematical thinkers and producers by confronting assimilation policies and governmental control of schools to reclaim their education and language autonomy. Their efforts focus on Indigenous teacher training courses that connect Indigenous teachers acting as mediators with external institutions such as universities, and their Indigenous schools and communities. These efforts are rooted in dialogical practices that draw on radical intercultural education, and which conceive of interculturality, decoloniality and ethnomathematics as a political and epistemological project connected to Indigenous territorial struggles.

Other actions taken to reclaim mathematical thinking are grounded on a meaningful redesign of a mathematics programme that takes as a point of departure students' experiences, families and communities, and Indigenous technology. Bhattacharya et al. (2021) describe a mathematics intervention with a decolonial vision conducted at Blake College, in California, USA, where five teachers implemented an interdisciplinary STEM and ethnic course focused on mathematics concepts and decoloniality for students of colour and first-generation college students. At the heart of this programme was not only mathematical knowledge, but also access to mentors and opportunities to participate in social projects that empower students to assume a critical examination of power structures.

Conclusion

In this article, we have examined how the theoretical perspectives associated with the 'sociopolitical turn' in mathematics have shaped the literature of SJM education. While existing literature has effectively highlighted the importance of social justice frameworks through a critical lens, our examination has revealed that, despite Gutiérrez's (2013) work, which invited researchers to follow in the steps of the sociopolitical turn, the use of CRT, poststructuralism and feminist theory are still relatively scarce. Nonetheless, these perspectives collectively offer a more comprehensive understanding of the intricate social and political dimensions involved in mathematics education. In addition to our analysis of these different frameworks, and their contributions to advancing social justice in mathematics, we have also integrated the emerging field of mathematics that is informed by decolonial theory. This theory, with its analytical ability to challenge conventional notions of social justice, has allowed us to point to the shortcomings of SJM, while also offering some ways to move forward. As mentioned initially, this article has argued that the pursuit of social justice remains incomplete without addressing cognitive/epistemic and ontological justice in tandem. We hope that future work in SJM will continue to draw on the theoretical perspectives reviewed throughout this article.

Ultimately, adopting a critical and decolonial sociopolitical lens is not solely aimed at gaining a deeper understanding of mathematics education 'in all of its social forms but to transform mathematics

education in ways that privilege more socially just practices' (Gutiérrez, 2013: 40). All the perspectives reviewed offer valuable insights into SJM, and they create the possibility to think across their differences to identify the ways they may complement one another without collapsing their distinct sociopolitical commitments. Just as critical mathematics education is limited due to its categorical emphasis on class, so too can CRT, poststructuralism, feminist theory and decolonial theory be limited when overemphasising one category at the expense of others. This limitation becomes evident when race is separated from class, or when gender is detached from other categories. Various theoretical discourses may thus obscure the material order of things when capitalism, racism and heteropatriarchy are not understood as intricately intertwined. We hope that this article contributes to the emerging decolonial turn in mathematics education.

Declarations and conflicts of interest

Research ethics statement

Not applicable to this article.

Consent for publication statement

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Conflicts of interest statement

The authors declare no conflicts of interest with this work. All efforts to sufficiently anonymise the authors during peer review of this article have been made. The authors declare no further conflicts with this article.

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