Toward a reflexive mathematics education within local and global relations: Thinking from critical scholarship on mathematics education within the sociopolitical, global citizenship education and decoloniality

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Education commonly is positioned as central to developing citizens who can address so-called global challenges. Responses are identifiable in global citizenship education, which may recruit mathematics into interdisciplinary relationships, and within mathematics education itself. However, if notions of the global and local, the citizen, mathematics, and mathematics education, are brought together uncritically, responses may inadvertently reproduce the inequities they seek to disrupt. In this conceptual article, we interrogate how and with what implications these notions are given meaning in mathematics education. We also think toward notions of place, subjectivity, relations, mathematics, and mathematics education, in a way that recognises power and differences that matter, without one place being synonymous with the universal, and one peoples considered superior. We articulate these ideas in questions for provoking scholar-practitioners' critical, reflexive thinking. For our contribution, we think from critical scholarship on mathematics education within the sociopolitical, global citizenship education and decoloniality.

Keywords: critical global citizenship education; critical decoloniality; critical mathematics education within the sociopolitical

1. **Introduction**

In the early 1950s, as the apartheid government in South Africa firmly entrenched racialised colonial hierarchies of difference, a range of organisations collaborated to produce *The Freedom Charter*. This envisioned, for a collective "We, the people of South Africa", a country belonging "to all who live in it, black and white", and in which "all the cultural treasures of mankind (*sic*) shall be open to all, by free exchange of books, ideas and contact with other lands" (Congress of the People, 1955). Since the first democratic elections held in 1994, an

"active citizenry" has been called on to contribute to the "development", "democracy", and "socially cohesive environment" (National Planning Commission [NPC], 2011, p. 26) articulated as being needed to build the nation envisioned in *The Freedom Charter*. This nation is envisioned as connected – via a strengthening global capitalism – to other nations, regionally, continentally, and globally (NPC, 2011). The current school curriculum, intended for all students, expresses a commitment to "social transformation", "human rights", "inclusivity", and "diversity", with "indigenous knowledge" deemed important thereto (Department of Basic Education [DBE], 2011c, pp. 4-5). It aims to "equip" students with "knowledge" and "skills" for "self-fulfilment" and participation, locally "as citizens of a free country", in higher education, and/or work, but also considers "global imperatives" and comparability with curricula elsewhere (p. 4).

Recently, United Nations member states collaborated to produce *The 2030 Agenda for Sustainable Development*, a "universal" plan of "action for people, planet and prosperity" to address "globally-shared concerns" (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2017, p. 7). This plan stresses the role of education in ensuring "that all learners acquire the knowledge and skills" for, amongst others, "the fulfilment of […] **responsible citizenship** from local to global levels", "sustainable development", "human rights", "gender equality", and the "promotion of a culture of peace" (pp. 13-14, emphasis in original).

While this last-mentioned document was produced by multiple member states of a global organisation, and the former documents involved collaborations in the global South, all conceptualise a vision of the world, relations between people, between people and the Earth, and between places. These visions respond to absences within and across contexts of: equality; movement; voice in governance; safety; and access to education, health, food/water security,

housing, dignified work, and land. These are complex, interrelated, social issues – commonly named 'global challenges' – that are experienced globally but in context-specific ways, cannot be formulated based on one internal logic (Rittel, 1973, cited in Kolko, 2012). They also cannot be solved simply by adding data, categorising and defining challenges more clearly, or breaking them down into small problems (Camillus, 2008). Yet, these are the approaches that characterise the Scientific Method, founded on the authority of objective Mathematics (Bishop, 1990; Green, 2020; Skovsmose, 2016).[1] Furthermore, viewing situated experience of these challenges (conventionally) from the global North, may lead to instrumental 'solutions' offered through Science and Technology, global capitalism, and "humanitarian" interventions (Mbembe, 2021, p. 11).

All the cited documents position 'education for all' as a right, but also as central to local and/or global citizenship. While education has long been called on to produce citizens (Biesta, 2008; Swanson, 2013; Westheimer & Kahne, 2004), specific attention to the *global* citizen has, since the start of the twenty-first century, grown internationally (Hartung, 2017; Swanson & Gamal, 2021). Educational responses – variously named global citizenship education, learning for sustainability, education for citizenship/democracy/social justice, and peace/human rights/intercultural education – may take the form of stand-alone subjects, inter/transdisciplinary activities, or be embedded within specific subjects. For example, the school subject Mathematics may be promoted as providing the necessary knowledge, skills and competencies for the development of the nation-state in a global world (Nikolakaki, 2016), or for understanding the effects of global capitalism and fostering democracy and social justice

[1] We follow Green (2020) in using *Mathematics* with a capital 'M' (similarly *Science*), for knowledge that has come to be regarded as authoritative, universal 'truth'. We use *mathematics* for a plurality of historical, sociopolitical practices that are changing and subject to question.

(e.g. Frankenstein, 1998; Gutstein, 2005). Yet the historical, sociopolitical nature of notions of local, global and their relations, citizen, subjectivities, and (Mathematics) knowledge, and how these meanings are constituted in relation to (Mathematics) education generally remain opaque (Gamal & Swanson, 2018). There is a risk, therefore, that these notions may not afford uncomplicated alignment and, in their operationalisation may inadvertently reproduce inequity by constituting hierarchical difference in peoples and places as (non-)citizens.

In this conceptual article, we first aim to *understand* how and with what implications these concepts have been co-constituted in relations between all places (sections 2 and 3) and specifically in Mathematics education (section 4). Secondly, in section 5, we *act* by thinking *toward* notions of place, relations, subjectivity, mathematics and mathematics education in a complex, uncertain world of (dis)connections and a common humanity. Sensitive to the danger of unintentionally (re)producing single logics and binaries by prescribing guidelines (Skovsmose, quoted in Alrø et al., 2010), we propose questions for use by *scholar-practitioners* – current and becoming school and university mathematics teachers, and mathematics teacher educators – to provoke our critical, reflexive thinking about mathematics curriculum, activities, learning materials and practices.

For our arguments, we think from critical scholarship on mathematics education within the sociopolitical.[2] While this scholarship has recently gained traction in the field of Mathematics

[2] We use *mathematics education within the sociopolitical* collectively for scholarship named as critical mathematics education, mathematics for social justice, ethnomathematics, indigenous knowledge, equity research, decolonial mathematics education, and critical global citizenship mathematics education.

education, considerable work is still required. This, since Mathematical categorisations and Mathematics education remain positioned uncritically as *central* to addressing challenges in a complex world characterised by "paradoxes of mobility and closure, or entanglement and separation, of continuities and discontinuities between inside and outside, the local and global, or of temporariness and permanence" (Mbembe, 2021, pp. 12-13). Thus, concerns about equity raised by scholars within the sociopolitical tend to be addressed, on a technical level, within existing structures that are contingent on inequity (Harouni, 2015; Pais, 2012). We argue, therefore, that it is necessary to *also* look *around* (Green, 2020) mathematics education scholarship, firstly, to think from *critical* global citizenship education scholarship (with its focus on power, difference, reflexivity, voice and decoloniality), and from *critical* decolonial scholarship. The last-mentioned is written from diverse places in which coloniality has been operationalised in situated ways (places commonly named collectively as the 'global South'). As demonstrated in this article, decolonial thinking is productive since, from sites of othering, it makes visible the hidden alterities of the historical, peopled co-constitution of *all* places, and offers new pathways for viewing the world (Gamal & Swanson, 2018; Mignolo, 2007).

Our choice of contextual examples from international organisations, South Africa, and Scotland recognises this historical co-constitution. It is argued that South Africa is an important case of a global South context; while decolonial practices emerged at different times in different places, in this context, coloniality was more deeply entrenched during apartheid, and the transition to democracy in the 1990s coincided with the "triumph" of global capitalism and intensification of transnational relations (Jansen, 2004, p. 201). Historically, Scotland is of importance because of unique nationalist discourses at play in this context that constitute Scotland as victim to English oppressions (Swanson & Gamal, 2021), yet it has also been identified as complicit in the racially-coded colonial practices of Europe since the sixteenth

century (L. Connell, 2004).[3] Furthermore, the contemporary Scottish school *Curriculum for Excellence* approach to education for citizenship is regarded as distinct from other approaches in two respects: it identifies 'responsible citizenship' as a 'capacity', and as one of four such capacities that permeate the *entire* school curriculum (Biesta, 2008), and is constituted as a 'whole school' approach to learning (Swanson & Pashby, 2016).

Our choice of examples is also aligned with our diverse experiences, positionings, and commitments. As authors, we share South African heritage, one writing from Scotland and the other from South Africa. We are conscious of the privileges, biases, and responsibilities that accompany our positionings within hierarchies of constituted difference – racial, socio-economic, political, ecological, and linguistic – within and across the places from which we think. It is this consciousness that has led each of us to locate our two decades of praxis as scholar-practitioners in *critical* perspectives in mathematics education, and in the case of the second author, also in *critical* global citizenship education.

2. The co-constitution of the global, local, subjectivity, and knowledge

From the early sixteenth century, colonial processes of expansion, domination and exploitation required and were given legitimacy by a hierarchical relation of difference between: what it means to be human (mind vs. body), peoples (coloniser vs. Other), peoples and the Earth, and places (Mbembe, 2017; Mignolo, 2007). Such difference involved conceptualising an 'inside' and 'insider' (or 'citizen') as superior relative to an inferior 'outside' and 'non-citizen' (Mignolo, 2010). Racial difference was key to identity-construction; the subjectivity of a

[3] Arguments about cultural and linguistic 'colonisation' of Scotland itself by England have been critiqued (e.g. L. Connell, 2004).

superior ‘white’, rational, self-made ‘man’ whose privilege is earned through hard work and ability, relied on a relational absence of achievement and the ‘human’ attributes of a ‘black’ Other (Green, 2020; Mbembe 2017). This racial hierarchy, which intersected with hierarchies of gender, spirituality, language, and knowledge, underpinned the moral narrative of the coloniser and their knowledge as necessary to ‘save’ Other peoples and places (Mbembe, 2017; Mignolo, 2010).

These hierarchies were held in place by a complex matrix of power relations involving, not just economic, military, legal mechanisms, but *also* knowledge institutions and control of subjectivity (Quijano, 2007). This was not a simple one-way North-South dominance, but coloniality was contingent on a complex *peopled*, *entangled* relation of authority, exclusion and inclusion, partnership, sponsorship, appropriation, and resistance (R. Connell, 2007; Dlamini, 2020).

Important for our argument is that, firstly, Scientific knowledge – underpinned by the universal descriptive, analytic and predictive possibilities of measurement, geometry, and methods of probability provided by Mathematics – gave legitimacy to these hierarchical relations (Breckenridge, 2014; Green, 2020). Indeed, the above-mentioned entangled relations are well-illustrated in the practise of Science; while theorising was done in Europe, the colonies were the sites of data collection, theory testing, and knowledge application (Breckenridge, 2014; Green, 2020).

Secondly, we highlight that, while coloniality required peopled power relations, its ultimate ‘success’ required *hiding* these relations and the ‘outside’. Thus, paradoxically, coloniality needed to be “concerned” with the racialised Other, “even when not concerned” with the Other (Dlamini, 2020, p. 61). The latter was achieved by positioning the legitimising Scientific knowledge as abstract, objective, and universal (Dlamini, 2020; Mignolo, 2010).

Thirdly, since the end of the formal colonial era, the hierarchical differences and the power matrix have been reinvented in successive global design projects of modernisation, development, global capitalism, cosmopolitanism, and digital technologisation (Mbembe, 2017; Mignolo, 2010). For example, 'developed'/'developing' and 'first'/'third' world country binaries assume some places and peoples as needing to 'catch up' to a 'standard' (Walker & Martinez-Vargas, 2020), and recruiting humanist, liberal, postmodern, Marxist ideas into global capitalism and a Kantian cosmopolitism recreates the colonial salvation narrative (Mignolo, 2010).

Finally, racial difference is currently being strengthened in contemporary collaboration between Technology, Science (for example, Genetics or Neuroscience) and capitalism (Mbembe, 2021), in which Mathematics in action (following Skovsmose, 2016) is masked. As all life is turned into electronically-coded commodities, valued for their ability to consume, 'race' is being (re)invented, taking on a "new mask" of consumer, in interplay with notions of ethnicity, religion, class, language, gender, and nationality in a practise of "racism without races" (Mbembe, 2017, p. 7). Contemporary Mathematics subjectivities are constituted hierarchically as constructors, operators, consumers or 'disposables' (Skovsmose, 2007). Transferable, usable knowledge and the related 'human capital' for transferring this knowledge from place to place are particularly prized commodities (Ernest, 2016). Next, we discuss how education is positioned to produce such 'capital'.

3. The co-constitution of the global, local, knowledge, and subjectivity in the education of the 'global citizen'

Scholars identify at least two dominant perspectives in discourses of global citizenship education, and similar others (e.g. Andreotti, 2014; Hartung, 2017; Gamal & Swanson, 2016; Marshall, 2009; Pais & Costa, 2020; Swanson & Pashby, 2016). Firstly, an instrumental view

of education as producing an individual global citizen with identified knowledge, skills and competencies to serve a neoliberal, competitive, interconnected world economy. This is an empowered, rational, hard-working, self-managing citizen who has the possibility of moving between the local and global and crossing borders freely and who unquestioningly adapts to fit in. Secondly, a liberal humanist perspective sees education as empowering the student as a global citizen to act morally, responsibly, and with 'tolerance' in recognition of diversity, but paradoxically, on account of a common humanity, for a more socially-just, democratic, and sustainable world.

While this second perspective appears to be more progressive and compassionate than the neoliberal view, both represent education of a so-called global citizen unquestioningly as a common good (Pais & Costa, 2020), universalist, and solutionist (Hartung, 2017). Furthermore, in their operationalisation in education, the two perspectives are often brought together as if naturally aligned (Bittencourt & Willetts, 2018; Swanson & Pashby, 2016). This is evidenced in the visions represented in the contemporary UNESCO and South African government documents cited in the Introduction, but also in others. For example, the Scottish school *Curriculum for Excellence* (Education Scotland, 2021a) centres four "capacities" aimed at students "becoming … successful learners, confident individuals, responsible citizens and effective contributors". Students should have opportunities to realise their "individual potential" and to learn the "skills" needed for learning, life, work and for "flourish[ing] in today's world". This includes "understanding the world, Scotland's place in it and the environment".

Without attention to their contradictory ideological lineages, liberal principles become subsumed or overtaken by neoliberal notions of rationality, profitability and efficiency, reinvigorating a salvation narrative under a banner of social justice (Hartung, 2017; Mbembe, 2021). Yet, this is an impoverished notion of democracy based on individualism and

nationalism, and on natural rights and freedoms to, and equal participation in *consumption* (Atweh, 2012; Mbembe, 2021). Furthermore, uncritically bringing these perspectives together may simply reinforce the masked hierarchical relations of Othering on which global design projects are contingent. This is achieved by reframing and normalising differences in terms of "diversity of local/global identities and interests" (Pais & Costa, 2020, p. 8), which should be celebrated and 'tolerated', and between which there is no antagonism, only "equal people discussing towards a common consensus" (p. 10). Indeed, Sriprakashet et al. (2018, cited by Walker & Martinez-Vargas, 2020), point to an absence of reference to 'race' in international development and educational discourse.

A liberal-humanist perspective may be drawn on to compensate or correct for the problems of neoliberal capitalism, that is, social injustice and inequity are regarded as 'errors' in the system to be corrected by responsible, individual, democratic action, rather than as central to the existence of the system (Harouni, 2015; Pais & Costa, 2020). 'Correction' involves those identified as needing 'development' relative to some standard, working harder and more efficiently, and adopting technologies (Andreotti, 2014). Those not 'catching up' as envisaged, are positioned as lacking ability, motivation and effort, and as posing a danger to the rest (Mbembe, 2021). This formulation puts the burden on the poor of what are co-constructed as global challenges, such as poverty (Andreotti, 2014). Specifically, 'poverty' is a strong theme in Scottish schooling, exemplified in *The Scottish Attainment Challenge* (Education Scotland, 2021b). Being a "responsible citizen" as encouraged in the Scottish *Curriculum for Excellence* (Education Scotland, 2021a) would involve, for example, teaching Mathematics to help poorer families 'budget better' to solve their own poverty, since "successful independent living requires financial awareness, effective money management, using schedules and other related skills" (Education Scotland, n.d., p. 2). As discussed next, this is a Mathematics 'made useful' in making the 'mathematics citizen' in accordance with particular economic and state interests.

4. The co-constitution of the global, local, mathematics knowledge, and subjectivity in the education of the 'Mathematics citizen'

Scholars of mathematics education within the sociopolitical have identified how Mathematics education – working with discourses of linear progress, competition, individualism, performativity, and choice – responds to the human capital requirements of the knowledge market in a technologically-constructed, global economy (e.g. Ernest, 2016; Llewellyn, 2016; Nikolakaki, 2016; Skovsmose, 2007). It is also argued that liberal-humanist notions of social justice and democracy have been recruited as tools and values – in the form of contexts and pedagogical practices – in the (re)production of a neoliberal perspective (e.g. Aguilar & Zavaleta, 2012; Nolan, 2009; Pais, 2012). Specifically, Mathematics education is regarded as "empowering" by: transmitting logical, abstract Mathematics; providing psychologically-meaningful experiences for individual students; enhancing relations between a students' cultural background and foreground when they learn mathematics "in context"; and critically exploring examples of Mathematics in action (Skovsmose & Vithal, 2008, cited by Pais, 2012, p. 60).

Thus, the agenda of Mathematics education practice and research – commonly exported unproblematically from global North contexts as supposedly-neutral knowledge – focuses on what should be included in Mathematics curricula, and what are effective and efficient teaching and learning processes, for all individuals as cognitive beings (Ernest, 2016; Harouni, 2015; Pais, 2012; Pais & Valero, 2011). This may involve: expanding educational technology use; using so-called real-life contexts related to everyday life, work, and social injustice; and attending to democratic classroom interactions. Efficiency is regarded as measurable, using assessments at the level of the student, teacher, school, country, with country-level 'achievement' linked to economic performance (Sriraman, 2016).

Thus, together, neoliberal and liberal-humanist perspectives position Mathematics as utilitarian (Dowling, 1998) for work, citizenship, and democracy *everywhere*. Mathematics education as a recontextualising practice (Dowling, 1998) is represented as a 'saving', social good, since it drives individual as well as (local and global) social, economic, and democratic political development (Pais, 2012; Popkewitz, 2002; Valero, 2008). The 'Mathematics citizen' is a knowing, individual subject, who offers an independent (and, where necessary, critical) Mathematical perspective of reality, and acts responsibly and without social constraints (Ernest, 2016).

While a liberal-humanist perspective might offer a positive gloss on dominant neoliberal conceptualisations, notions of social justice, development and democracy, and the assumptions about identity and equity on which they are based, are not naturally aligned with the authority of Mathematics and Mathematics education and their role in neoliberal capitalism (Aguilar & Zavaleta, 2012; Atweh, 2012; Nolan, 2009). Conflating liberal-humanist and neoliberal perspectives means that democracy and inclusion are built into a system that is itself contingent on inequity, giving the system legitimacy (Pais, 2012). Thus, inequity in Mathematics education tends to be seen as an 'error' in the system, that can be fixed with better instruction for all (Harouni, 2015; Pais, 2012). This has the effect of masking the exchange relation (Dowling, 1998) that Mathematics and Mathematics education perform in the power matrix, that is, these practices are *needed* to reproduce the hierarchical differences that underwrite neoliberal capitalism (Pais, 2012). Also hidden is that being an autonomous, mobile 'Mathematics citizen' is contingent on the failure of many (Aguilar & Zavaleta, 2012; Valero, 2014), a violent relation of inclusion/exclusion based on racial, and related socio-economic, gender, and language hierarchies (Martin, 2019; Pais, 2012; Swanson, 2004). Thus, these hierarchies are normalised, and where they *are* recognised in an 'achievement gap', this can be solved by some 'catching up' through harder and better work (Martin, 2019). While the

importance of unmasking such hierarchies is central to our intentions in this article, what we trouble here is the framing of 'the problem' and its 'solutions', as exemplified herein, and how subjectivities can be reified and reproduced pedagogically (Swanson, 2010).

The practice of Mathematics and Mathematics education articulated here can be traced in the constitution of the school subject Mathematics in South Africa. In the development of one curriculum for all the peoples of South Africa (Congress of the People, 1955), and in the transition to formal democracy in the 1990s, People's Maths and ethnomathematics were brought to the discussion table as recognition of the Other as a mathematics participant (e.g. Bopape, 1998). Yet, ultimately, practices involving notions of outcomes, learner-centeredness, real-life contexts and educational technologies were imported from elsewhere (Adler & Lerman, 2003; Jansen, 2004). And when imported assessments – regarded as indicators of the relative "quality" of the curriculum (DBE, 2011c, p. 5) – measure South African schooling (and students) as not 'catching up', and global North research practices do not 'see' the valued transformational mathematics education practices, deficit views of certain places and peoples are reproduced (Adler & Lerman, 2003).

We follow Dowling (1998) to argue that, following successive revisions, the current curriculum for the subject Mathematics (DBE, 2011c, pp. 8-9) represents Mathematics as independent of and preceding the social: it aims to "equip" students with "knowledge" (number, functions, algebra, measurement, and so on) and "skills" ("mental processes" for problem-solving, logical, creative and critical thinking). Yet, Mathematics gains relevance through its supposed utilitarianism in that social world, that is, in its application in "physical, social and mathematical problems" for "decision-making" and "personal development."

The recruitment of (global) citizenship discourses in this school curriculum affords Mathematics and the 'Mathematics citizen' differentially, with an outwardly-looking

orientation (Swanson & Gamal, 2021). The student enrolled for the subject "Mathematical Literacy" in the final three years of schooling will use Mathematics as a "tool" in "contexts" such as baking, tax, running a business, HIV/AIDS, and mobile phones. This will "equip" them to be "self-managing", responsible with their budgets, and a "contributing worker and participating citizen in a developing democracy" (DBE, 2011a, pp. 8-9). It is only those who complete the subject Mathematics in the final three years of schooling who are positioned as "responsible citizens in the life of the local, national *and* global communities" (DBE, 2011b, p.9, our emphasis) and as having access to post-compulsory Science and Technology learning opportunities.

Indeed, 30 years after the transition to formal democracy in South Africa, there exist stark inequities in who is constituted as an "active" (NPC, 2011, p. 26) 'Mathematics citizen' connected to others locally, regionally, continentally, and globally. While policy aims to address colonial and apartheid-era hierarchical inequities, it has also enabled individuals and individual schools to "escape" this legacy (Chisholm, 2012, p. 99). It is generally agreed that South Africa has two school systems – "fortified" vs. "exposed" schools (Christie, 2020, p. 23, citing Teese & Polesel, 2003) – with four-fifths of all schools classified as the latter and not in a position to "catch up" to fortified schools (Christie, 2020, p. 8). Crucially, exposed schools may not offer the subject Mathematics in grades 10 to 12, leaving students with only the option to act as a worker and citizen locally (DBE, 2011a), rather than globally (DBE, 2011b). Yet, not many are likely to meet the requirement for either. Of those who start school, approximately 12% might meet the 30% pass mark of either the subject Mathematical Literacy or Mathematics in grade 12, and 3% of (mainly fortified) schools produce more distinctions in the subject Mathematics than the rest (Spaull, 2019). Further, it is not only those who do not meet this pass mark for these subjects who are constituted as 'failed' citizens (Swanson, 2013); data show

that almost half of South African youth are unemployed and are likely to remain so in their lifetime, and for those 'in work', it is likely to be informal and precarious (Spaull, 2015).

5. Thinking toward place, relations, and subjectivity in mathematics and mathematics education for a common humanity

Scholarship on mathematics education within the sociopolitical has long offered responses aimed at more critical, socially-just, democratic, equitable practices (e.g. Frankenstein, 1998; Gutstein, 2005; Harouni, 2015; Khuzwayo, 1998; Pais & Costa, 2020). Yet, it is acknowledged that these do not offer easy escapes and may be put to work within global design projects in unintended ways (Atweh, 2012; Nolan, 2009), demonstrating that alternate action needs vigilance, reflexivity, and a disposition of constant political noticing.

Yet, thinking toward alternate pathways requires more than this, since thinking from *within* Mathematics (education) involves thinking from practices that, as we have demonstrated in sections 2 to 4, are *centred* historically in global design projects. Furthermore, descriptions of the complex, changing nature of the contemporary world (such as that by Mbembe, 2021, cited in the Introduction), highlight the limits of viewing the world from one conceptual space, and in particular, from a perspective of the world "modelled on the law of nature discovered by science" (Mignolo, 2010, p. 117), a Science that is founded on Mathematical categorisations. Rather, such descriptions point to the need for thinking that "hold[s] uncertainty" (Bhan, 2019, p. 651) and that works with paradoxes rather than providing prescriptive "guidelines for what to do and where to go" (Skovsmose, quoted in Alrø et al., 2010, p. 6). Such thinking includes critical mathematical literacies, but *also* contests Mathematics and Mathematics education as primary solutions to contemporary challenges. It recognises the entanglement of all places, but also the situated (inequitable) manifestation of this entanglement. It also recognises the enduring historical power relations of this entanglement and challenges dominant assumptions

about diversity and equity, while working for more equitable ways of living together. Thus, in section 5.1, we forage *around* mathematics within the sociopolitical in critical scholarship on decoloniality for ways of thinking about place and peoples (and their relations), knowledge, and time.

5.1 Thinking from decolonial scholarship toward place, relations, time, knowledge, and subjectivity

The historical co-construction of all places in successive design projects, as described in section 2, suggests the need to view *time*, not in linear terms, but as an entangled folding of "presents, pasts and futures that retain their depths of other presents, pasts and futures, each age bearing, altering and maintaining the previous ones" (Mbembe, 2015, p. 16). We propose an entangled *relation* in folded time – a 'decolonial cosmopolitanism' (Mignolo, 2010) – that recognises *power* and also *differences* between places and between peoples that matter, without one local (traditionally the global North) being synonymous with the universal. This is a plurality in which "there are many multiple memories and colonial wounds infringed by racism, ways of life, languages, beliefs, experiences connected to the West, but at the same time, not subsumable to it" (Mignolo, 2010, p. 126). Here, *local* is not a tightly bound concept, but a contingent, paradoxical space (Mbembe, 2021), defined at multiple scales, including *within* nation-states.

Crucially, this conceptualisation is not about turning "the story upside down" (Comaroff & Comaroff, 2012, p. 7) in a new form of hegemony, neither does it involve romanticising multiple local knowledges in a relativist mosaic. Rather, since the historical entanglement is experienced by all, but in situated ways (Mignolo, 2007), and all places and peoples have meaning (Hodes & Morrell, 2018), it follows that we need multiple perspectives for acting in folded time, with no perspective complete. Indeed, all identities and knowledges – individual

and collective – are incomplete and thus in need of relations (Nyamnjoh, 2020). Decolonial cosmopolitanism *also* involves accounting for multiple, related subjectivities and actors: place, the human mind and body, the Earth, materialities such as technology, and knowledges.

Having thought around mathematics education within the sociopolitical toward place, relations, time, knowledge, and subjectivity in a decolonial cosmopolitanism, in section 5.2 we articulate these ideas in questions for provoking scholar-practitioners' critical, reflexive thinking that holds our mathematics education praxis to account.

5.2. Questions for provoking critical, reflexive thinking about mathematics and mathematics education

We propose questions for use by scholar-practitioners – current and becoming school and university mathematics teachers, and mathematics teacher educators (ourselves included) – to provoke our reflexive, critical thinking about mathematics curriculum, activities, learning materials and practices, and our positionings therein. There is no impediment, however, to using these questions for discussion with students in school and university mathematics classrooms. Including these students in such reflexive, critical thinking potentially increases plurality of perspectives, in ways that move beyond instrumentalism and tokenistic inclusions.

Our questions are informed by the conceptualisation in Section 5.1, the wording of which is threaded through the questions. These *also* draw on ideas originating in the work of one author, Swanson (2020), in a critical global citizenship education/learning for sustainability module in a teacher education programme in Scotland. Specifically, Swanson developed questions to provoke these becoming teachers' thinking as they collaborated in interdisciplinary groups on designing a global citizenship project for primary and secondary schools. The ideas have also

been discussed with scholar-practitioners in global citizenship education and mathematics education.

Provoking critical, reflexive thinking about mathematics curriculum, activities, learning materials, and practices:

1. What and whose local (mathematics) knowledges, ways of knowing, acting, being and valuing are represented?
2. Does the representation account for a plurality of locals?
    a. Does the representation attend to locals across *and* within places?
    b. What are the histories of these locals, and how might they retain their depths in the present and future?
3. How are these locals related? In a relation of consumption by one local? And in whose interests? Do all locals having meaning? Are all locals recognised as incomplete? And what role is each local assigned? Are assumptions being made about the equality of locals without recognising power asymmetries? What are the differences between locals, and which of these matter and for whom?
4. Are mathematics and mathematics education related to other actors; to knowledges, the human mind and body, the Earth, and technology? Do mathematics and mathematics education cast an instrumental, all-encompassing gaze for acting in the world? What are the possible limitations?
5. Do valued mathematics and mathematics education account for complexity, uncertainty, incompleteness, flexibility, transience, mobility, informality, and differences that matter?

Provoking critical, reflexive thinking about our various positionings as scholar-practitioners in relations:

1. Where and how does my own and my local's mathematics and mathematics education cast a gaze and act in folded time? For whom do they speak? What relations do they constitute? And with what consequences do they speak for myself, my local and others?
2. What (mathematics) knowledges, ways of knowing, acting, being, and valuing does this gaze marginalise and/or render absent? What are the consequences of this gaze for what is constituted as mathematics and mathematics education, their positioning in the world, and mathematics subjectivity? In what ways is this gaze incomplete? And what relations does it need?
3. What are the privileges that I have gained in folded time by acting with a particular mathematical gaze? What do I, in my togetherness with others, need to give up? What relations do I, in my togetherness with others, need to act for a more just and sustainable world? And with what implications for me and for others?
4. What historical values, and what relations and positionings therein inform my action in mathematics education? How might these retain their depths in the present and future? And on whose behalf do I, in my togetherness with others, speak?

6. Conclusion

Our concern in this conceptual article is the dominant propensity for uncomplicated alignment of notions of global and local and their relations, the subjectivities they enact, mathematics, and mathematics education in contemporary discourses. Firstly, we offer a reading of the making of such discourses, thinking from critical scholarship in mathematics education within the sociopolitical, global citizenship education and decoloniality, and from empirical global North and South examples. Specifically, we highlight how these notions are put to work to subsume social justice, democratic, and equity imperatives in the reproduction of Mathematics and Mathematics education for global capitalism. This reading alerts us to the need for constant vigilance regarding the operationalisation of these notions in folded time, *and* to think toward

alternate conceptualisations of these notions and their relations. The latter requires thinking *around* the Mathematics and Mathematics education practices that are centred in global design projects.

In offering one alternate pathway in this article, we are sensitive to the danger of single logics and binaries, and thus do not offer a prescriptive response. Rather, we think toward a form of decolonial cosmopolitanism that recognises time, peoples, and places as entangled in relations of (dis)connection, and which accounts for multiple (necessarily) incomplete knowledges, subjectivities, and actors at multiple levels of the local. These ideas propel us to a set of questions for provoking scholar-practitioners' reflective, critical thinking about mathematics curriculum, activities, learning materials and practices. Thus, our response embraces mathematics' and mathematics education's "uncertainties, concerns and imaginations" (Skovsmose, quoted in Alrø et al., 2010, p. 7), while holding these two practices and our positionings therein to account. We are confident that the conceptualisation and provoking questions proposed here – enabled by our thinking around mathematics education scholarship – warrant further development, in conversation with other ideas recruited by mathematics education scholars writing from multiple locals.

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