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Performing Oneself Differently: A Mathemaesthethician's Responsibility[1]

Steven Khan
University of the West Indies

Abstract

Ground Zero

> Whereas young people become accomplished in geometry and mathematics, and wise within these limits, prudent young people do not seem to be found. The reason is that prudence is concerned with particulars as well as universals…
>
> –Aristotle, 1142a

> For Homer, the patterns of geometric and archaic thought and large parts of fourth-century Athenian common sense were not tied to individual cases; they contained generalizations and used universals to give them substance. But these universals did not supersede or constitute particulars, they connected them. We might say that the universals of Plato…are tyrants which "annihilate" particulars while the universals of their rivals mediate between them while leaving them unchanged.
>
> –Feyerbend, 2001, 52

> *I observed six youths, all males, in the distance some standing and sitting on the same road [that I was traveling along]. About 10 p.m., as I reached a dark area on the right where the youth were hanging out, without a word, I was attacked by them. Some held my hands and some my shirt and I was repeatedly beaten with their hands striking me in my head and face…These youths then attempted…by pulling and pushing me to try to get me in an even darker area which leads to the beach…however I struggled with them and repeatedly called for help… The ordeal lasted about three minutes during which I successfully made my escape…These young men that attacked and robbed me all appeared to be teenagers between the ages of 14 and 18 years old and they all wore black [and white] scarves around their faces. I have no knowledge of my attackers and would not be able to identify them should I see them again.*
>
> –Statement of Witness, Steven Khan, 17th January 2008.

Welcome.

I have had to revise this piece over and over again as I try to connect and reconcile the desires expressed in the call for papers with my own recent experiences as a 'student'[2] of teenage gang violence, a citizen of a small twin-island Republic psychologically crippled by a statistically incomprehensible level of brutality, and as a young writer/creator within the academy in (mathematics) teacher education. Two and a half years ago, when I first began trying to connect mathematics, aesthetics (the arts) and ethics, and at that time witnessing rising tides of violence and suffering from outside of my region, I wrote in a course paper: "Academic disciplines that fail to establish clearly a link between what is learnt and the responsibilities of individuals to other individuals, to their societies and to other societies, fall short of realizing the full potential of the educational project. Mathematics and mathematics education must find ways and means to link the domain to the most basic of human desires as well as the most noble of human aspirations." I take this statement now as a marker, a testament, to an urgent imperative in the work I am trying to perform[3] as a mathemaesthethician examining relationships between mathematics and art/aesthetics, while exploring the possibilities for more responsible (global) civil society amidst the tensions wrought by encounters between overwhelming diversity and conflagrate, contradictory values (Appiah, 2006, Matsuura, 2004). My work/performances are oriented around a question of how I engage myself and others as a (mathematics) teacher/educator in forming (and performing) lifelong *ethical* relationships with and between different, diverse peoples, places, things, and thoughts (Khan, 2006) within proliferating, putrefying, and petrifying carrion structures, cultures, and societies,[4] where *wuk*[5] seeks to consume space, time, energy, and even desire for Work?

In my meanderings I have arrived at a tentative conclusion that the telos of mathematical experiences ought not only to be mathematical knowledge and power. Rather, mathematics' destination, like that of Art discussed below is, I believe, elsewhere: in love, ethics, responsibility *for* the Other and, I want to suggest, perhaps, something deeper. An invitation to perform mathematics and mathematics education *differently*, which I have chosen to call a 'mathemaesthethic disposition[6],' reveals one's responsibilities as an ongoing commitment to democratic community[7] formation through the welcoming of difference by dialogic communication (Alrø & Skovmose, 2003; Bakhtin, 1981; Khan, 2006b; Renshaw & van der Linden, 2004). This commitment also entails the rendering of mathematics in ways that are "evocatively resonant" through attempting connections between meaning-full personal and aesthetic experiences (Betts & McNaughton, 2003; Papert, 1978; Picard et al., 2004; Sinclair, 2006), and by providing a means for understanding and addressing/redressing our seemingly infinite capacity as individuals, communities and corporations for the brutalities generated by pathological asymmetries of power (Gutstein, 2005; Sen, 2005), by learning how to be for an Other, i.e. ethics. Such a disposition is not the exclusive purview of mathematicians, artists, or educators, but of any individual or group committed to justice, compassion, and ethics *through* education viewed as a synaesthetic (Root-Bernstein, 2002) transcendent, and immanent project.[8]

I have also come to believe that mathematics education is a universal tyrant in social and cultural iatrogenesis, i.e., it makes people, culture, society and social institutions sick and disrupts their agentive capacities for recuperative intervention by denying them access, power, and opportunities for creative transformation of their own lives. Indeed, the legacy of mathematics education globally is overwhelmingly that of massive failure and systemic suffering on an incomprehensible scale (Higginson, 1999). Fractally amplified[9] across economic, political, cultural, technological, environmental and personal landscapes, stories of

poverty, inequity, failure, suffering, greed, corruption, violence, and disaster speak of pervasive and pernicious pathologies in which mathematics education, and her siren sisters, science and technology, facilitators among discourses of power, exclusion and oppression, are conspicuously implicated. This pathology includes mathematics and mathematics education's complicity in the creation, rationalization, and maintenance of an increasingly anachronistic, inhuman, industrialized, corporatized, and militarized conception of schooling (Giroux, 2007), the globalization and ghettoising (Skovsmose, 2006) of curriculum and culture, and the entrenchment of hypercompetitive, exclusionary, and individually and socially harmful "winner takes all" markets (Frank & Cook, 1995) which threaten all of our liberties, physical and mental health, and undermine democracy's foundations worldwide.

Mathematics education's complicity in this 'glocal' pathology, its unrepentant sins of commission and omission, however, provides direct access to the infrastructure necessary for its transformation and healing. A mathemaesthetical disposition provides (me) a *means* for effecting such transformations by re-conceiving the answer to the question "*who and what is mathematics education for?*" from the present dominant and unquestioned corporate, military, engineering, economic and technological pursuits of a privileged few, to be *for* ethical relationships with an unknowable Other. I want to argue that perhaps the human desire "to make beautiful" art can serve as a necessary mediator between the tyrannical tendencies of mathematical universals and the urgent need to develop practical wisdom, prudence or *phronesis* in education and society by helping us to responsibly connect the most powerful universals with the most familiar, meaningful, and resonant particulars of individual lives. Perhaps art can also help us to reorient our selves away from brutal, egoistic and nationalistic concerns around employment and economic competitiveness and too narrow views of mathematical power emphasized in authoritative international curriculum documents, towards re-conceived *visions* of the possibilities of education taken as a whole. Perhaps in this way we might as mathematics educators recognize our complicity in re-producing and re-inscribing suffering on violated bodies around the world, including our own. Perhaps…

There are few specific treatments of mathematics and ethics, and many more regarding the contested relation between mathematics and art/aesthetics. The recent literature of the last 30 years in mathematics education, however, is encouraging as there is an increasing concern with ethical issues, though usually covered under other terms like access, equity, discrimination, oppression, liberation, emancipatory discourse, culturally relevant, critical, inclusion, and social justice. Many mathematics educators have begun to respond positively to D'Ambrosio's (2001) challenge and critique that, "particularly in mathematics, there is an assumption that we are fulfilling our responsibilities if we do our mathematics well, thus instilling attitudes of rigor, precision and correctness in our students…But this is not enough" (331). Indeed, in facing the lengthening shadows cast by violence, terrorism, war, corruption, growing disparities between nations and among individuals and groups within nations that create new and more permanent and insidious forms of slavery and suffering, and facing the prospects of global ecological Holocausts, we would be failing to meet our responsibilities by merely "doing our mathematics [or mathematics teaching] well."

My work is oriented by a Levinasian view of taking ethics as an alternative starting point for philosophy, relationships and sociality (Levinas, 1969, 1981) and by Deleuzeian ideas regarding philosophy's task as the creation of concepts that enable thinking which does not identify but rather '*palpates*' difference, and in so doing makes it 'audible,' thus allowing difference to 'speak' before its visible identity makes it known. I attempt to "trace a path between impossibilities" (Deleuze, 1995, 133) by trying to think the difference one never thinks one can ever think, through posing *Why* and *What if?* questions (Fleener, 2004). Following Deleuze again, I experiment with the ethical possibilities around the question: What *might* living/performing mathematics and mathematics education *differently/ethically*

consist *in*? (See May, 2005 for commentary on Deleuze's question of 'living'). These starting positions, I believe, reveal but do not fully disclose or prescribe the situated principles, practices, and processes, which render the *possibilities* of (more) sustainable and ethical democratic relationships more likely.

In this paper I argue that Art, and mathematics education when performed as an Art, can provide us with a means to come face-to-face with and learn to welcome Others, which reveals our responsibilities to be *for* Others. This revelation, which is a teaching, then challenges us to accept and act on these responsibilities in future encounters in a particular way, i.e. ethically, and so opens up possibilities for new forms of social organization and sociability, a necessary condition for reconstituting relationships, including democratic ones. It is necessary though to begin with a discussion of ethics.

First Iterations: Beginning with Ethics

[10]

> The irreducible and ultimate experience of relationship appears in fact to be elsewhere, not in synthesis, but in the face to face of humans…morality comes not as a secondary layer… morality has an independent and preliminary range. First philosophy is an ethics. (Levinas, 1985, 77)
>
> One can see this nostalgia for totality everywhere in Western philosophy, where the spiritual and the reasonable always reside in knowledge. (Levinas, 1985, 76).

The experiment motivating this section and my recent thinking is "*What if* we began thinking about mathematics education starting with ethics?" Such an experiment finds resonance with recent work such as Skovsomse (2006), Eisenberg (2008) and Stemhagen (2008), the latter arguing for "a recognition, even an embracing of the human and hence, of the ethical dimension of mathematics" (60). In tracing the contours of the relationship between mathematics, aesthetics and ethics, I have been drawn to the writings of and about French theorist Emmanel Levinas. All of Levinas' major works are written "in the shadow of the Holocaust…[and] bears a distinctive weight, indeed a heaviness…There is present…an exigency to attend to suffering, injustice and violence, and his account of the ethical becomes a labour born not only of philosophical interest, but human necessity" (Todd, 2003, 2). Such exigency is what is necessary in responding ethically to the present pathologies in which mathematics is implicated.

For Levinas, Western philosophy typically approaches its phenomena of interest from an ontological perspective, i.e. it attempts to determine 'what is,' to establish *identities* and determine *essences*, to demarcate between that which is and which is not (Pinchevski, 2005). From this position ethics is seen as subsequent to ontology and emerges as a series of ***'oughts,'*** prescriptions on ***being***, based on ***what is***. Levinas questions this obsession of (Western) philosophy with '*grasping*' the nature and identity of the Other as a prelude to diminishing or collapsing the Other's otherness to sameness. Ethics for Levinas is *first* philosophy, i.e. it is *pre-ontological*. It precedes ontology. For Levinas, the *meaning* of ethics does not lie in identities and essences that lead to prescriptions of what one *ought* to do, but

rather:

> Ethics does not have an essence, its "essence," so to speak, is precisely not to have an essence, to unsettle essences. Its "identity" is precisely not to have an identity. Its "being" is not to be but to be *better than being*. Ethics is precisely ethics by disturbing the complacency of being…Ethics occurs as an an-archy, the compassion of being. Its priority is affirmed without recourse to principles, without vision, in the irrecuperable shock of being-for-the-other-person before being-for-oneself, or being-with-others, or being-in-the-world… (Levinas, 1985, 10)

This is a very different and difficult place to begin thinking about mathematics education. The comfort of content and easily defined and measurable objectives vanishes, and with it attempts to define and delimit what students *ought* to learn. Such prescriptions, codified in curriculum, syllabus and assessment objectives by their totality, violently reduces everything and everyone to a singularity of sameness, a mean, that precludes the very conditions under which truly ethical responses to difference might emerge—the experience of relationship to the Other. But *what if* we were to be for the Other, even before being for mathematics? *What if* we were to teach/perform mathematics (education) in this way? Perhaps, by adopting the position (or disposition) of being for the Other we might begin to reorient our selves and open possibilities for imagining a mathematics education that is Otherwise (Säfström, 2003). But we must first come into a presence, that of recognition of the difference of the Other in the traumatic and open encounter with the vulnerable face of the stranger.

The face is a central concept in Levinas' writings. It is, he says, "that which stays most naked, most destitute, though with a decent nudity…there is an essential poverty in the face. (…) The face is exposed, menaced, as if inviting us to an act of violence. At the same time, the face is what forbids us to kill" (Levinas, 1985, 86). In mathematics education many faces are as yet still conspicuously absent (Skovsomse, 2006) or their differences are rendered within sterile academic tropes that marginalize, pathologize or otherwise position and construct such difference as deficiency, deviancy or disability. Many students do not see their own faces, nor the faces of any Other in the way(s) mathematics is presented. The emergence of the ethical relation and the infinite responsibility of the ethical subject, as Levinas conceives him, depend on appreciating the phenomenological approach and address of the Other manifested as face. The nakedness of the face, its vulnerability and fragility, is a call that addresses me directly and calls me forth to be responsible and answerable to the Other who "orders and ordains me" (Levinas, 1985, 97) in the very moment of encounter. Indeed, the face "speaks, it is in this that it renders possible and begins all discourse" (Levinas, 1985, 87). The presence of the Other manifested as face, as Pinchevski (2005) notes, ruptures my egoist concerns by "speaking, addressing, questioning, demanding…[it] causes me not to be at-home with myself"(218). The face requires response.

Our first relation then for Levinas is one of responsibility *for* the Other which emerges out of the meeting of face-to-face, an intersubjective encounter with unknowable difference that does not seek unity or synthesis, but which calls me forth out of my self in his demand for a response. Such response is a *witnessing*, "a revelation which is not a knowledge" (Levinas, 1985, 106). The witnessing however is as Zembylas (2005) describes, "a witnessing to what the Other accomplishes *in me* (i.e. the Other *creates me* as a responsible person)" (italics added, 148). In another radical departure from the familiar (mathematical and aesthetic) values of balance and symmetry which underlie modern notions of equity, fairness, and justice, Levinas proposes that the ethical relation, "is a non-symmetrical relation...I am responsible for the Other without waiting for reciprocity…Reciprocity is his affair" (Levinas,

1985, 98). And since his is a non-prescriptive or totalizing ethics one can never be certain of having fulfilled one's debt to the Other who addresses you and so one is always open, already responsible, ready to receive the call of the other to responsibility. Indeed as Pinchevski (2005) notes, "[r]esponsibility here means exceeding rather than following social norms" (216). Thus our responsibility for the other, rather than becoming *an obligation*, becomes *a Desire*. Such Desire, as Levinas (1985) explains is "the relation to the Infinite [which] is not a knowledge…Desire [unlike need] cannot be satisfied…Desire… nourishes itself on its own hungers…Desire is like a thought which thinks more than it thinks, or more than what it thinks" (86). Such is our responsibility *for* the Other, a relation to the Infinite that is not a knowledge, and which overflows our capacity to think it. How might we help students to come to desire by performing mathematics as a means of and for responsible action?

For many students of mathematics, at all levels, mathematical activity is an obligation, something that must be done. It is often presented as a (largely) faceless edifice to be scaled. In my recent third (final) year B.Ed course, *Mathematics Around Us*, after some discussions and readings around ethnomathematics I invited students to choose and interview two individuals from different career tracks, one where mathematics was clearly evident and the other where one could not easily see mathematics being applied. This was to be an opportunity for them to encounter difference face-to-face as well as learn about how mathematics is actually used. Tricia, a primary school classroom teacher, chose her school's janitor. She was quite moved by Mrs. Lewis' response to being interviewed and wrote in her journal:

> *On the day of presentation I was all excited to tell of my interviewee, and not about what I had learnt, but about how excited she was after learning so many things about her career that she never saw prior to this interview. My interviewee saw herself as having some worth after she realized how much mathematics there was in her daily cleaning of the school. This made me reflect on how much we as teachers can use such strategies to teach our children how valuable even the jobs that we 'look down on' really are.*

Tricia speaks not about what she has learnt, but rather what Mrs. Lewis has accomplished, how her encounter with this Other has created her, and now calls her to a new orientation in her teaching. Tricia's presentation/performance also drew a significant response from her colleagues. Rinnelle, for example wrote in her reflection on the assignment and class presentations:

> *Though each presentation made by fellow classmates was informative and provided 'food' for thought, the one that made the greatest impact on me was the presentation about the interview conducted with the school cleaner…Initially, as is the case with many individuals who engage in activities that are not explicitly mathematical, Mrs. Lewis could see no mathematics in her job. However, it was seen that through her explanations of how she conducted her duties, that there were many mathematical concepts involved. When she did realize this, as Tricia reported, she was surprised and proudly assented to the fact that mathematics was involved in what she did. This really touched my heart, as too often cleaners like Mrs. Lewis are disrespected by teachers and children because of their duties,*

> *but here it is this cleaner gained some respect for herself and what she did because something as 'important' as mathematics was found in her job.*

Through the interview and Tricia's witnessing/performance in the classroom, Rinnelle's ethical sensitivity to the brutal effects of social hierarchies is heightened and she too testifies not to what she has learnt, but what this encounter, through Tricia's *mediation/meditation*, has accomplished in her.

In watching the recording of the interview and reading Tricia's report, what most stood out for me was the moment when Mrs. Lewis' countenance changed, her face, somewhat fatigued throughout, at one point, lights up with the joy and pride of recognizing that "something as important as mathematics was found in her job."[11] In the classroom it is the joy and profound respect with which Tricia's face and words speak of her encounter with difference, and connecting with their own experiences that so moves the other members to a new and deeper awareness of their relationship both with mathematics and with Others, especially those perceived to be the least members in the society. The desire that emerges is to help their students to likewise encounter and value difference and to respond respectfully and responsibly to this gift. They begin to speak, to write difference, to imagine, mathematical practices that might be Otherwise. They and I bear witness to what these encounters accomplished in them: what and how the presence of an Other teaches when welcomed.

Second Iteration: Welcoming the Other - Art's Revelation of Ethics

> The presence of the Other is a presence that teaches (Levinas, "The Transcendence of Words" *Outside the Subject*, 148).
>
> The Other is manifested in a Mastery that does not conquer, but teaches. Teaching is not a species of a genus called domination, a hegemony at work within a totality, but is the presence of the infinite breaking the closed circle of totality (Levinas, 1969, 171).

The emergence of ethical subjectivity, for Levinas, requires a disposition, to welcome, the unknowable Other, the stranger, who approaches and addresses me, whose face invites me to respond, whose presence unsettles me and teaches me. Welcoming the Other is the first response in the revelation of witnessing to the emergence of an intersubjective relation of responsibility for the Other. *How* the self welcomes the Other, receives the Other and whether (or not) he allows himself to be taught by the Other is at the heart of what Todd (2006) identifies as a "theory[12] of learning" in Levinas's philosophy of welcoming which is less concerned with how a subject learns content than with how a subject learns *from* the Other through the orientation or disposition to welcome. The Other who is separate(d) from me, comes to me as Master, teacher, a stranger to my self, who offers gifts of difference,

difference *about* what I do not yet know and difference *from* whom I cannot know completely, but *to* whom I am already in relation, and *for* whom I am already called to be responsible. The presence of the Other teaches me "otherness itself" (Todd, 2006, 4). Thus the welcoming of the Other is a necessary disposition for being taught. Such welcoming, as Todd (2006) explains, is:

> not a gesture that seeks to reduce the independent nature of the Other's existence through domination, identification, understanding or even care; it seeks not to "envelop" or to protect. Rather it stands as an affirmation of the Other's strangeness… Welcome is an ethical testament to the separation between me and the teacher…welcome invites as it receives the Other…(8).

The excerpts from Tricia and Rinelle's encounter above speak to this affirmation of strangeness.

Generosity and hospitality underscore the orientation to welcome as "an extravagant response" (Levinas qtd. in Todd, 2006, 11) to what the Other offers and are thus appropriate manifestations of the acknowledgement of the gift that the presence of the other bequeaths. Hospitality (*hospitalité*) for Levinas however is inseparable from the dwelling (home). As he says: "I welcome the Other who presents himself in my home by opening my home to him" (1969, 171). Thus as Gauthier (2007) argues, the home "achieves its full dignity when the Other is welcomed into it, thereby transforming it…"(160). The home is unique in that it is the site from which the self, by being safely housed, by being itself welcomed as a guest into the home, can "recollect itself in earnest" (Gauthier, 2007, 161) so that it can extend hospitality to the Other as host. This sense of the self as both guest and host is emphasized by the French word *hôte,* which Derrida (qtd. in Todd, 2006) uses to explain the Levinasian welcome as:

> The *hôte* who receives (the host), the one who welcomes the invited or received *hôte* (the guest), the welcoming *hôte*…is in truth a *hôte* received in his own home. He receives the hospitality that he offers in his own home; he receives it from his own home…The *hôte* as host is a guest (9).

In welcoming and inviting the Other to dwell *with* me in my home not as an extension of myself, both dwelling and dweller are transformed. As Gauthier (2007) describes,

> When the Other is welcomed into the home, the latter ceases resembling a 'root' that the self puts into the ground as a means of isolating itself from its fellows: 'The chosen home is the very opposite of a root' (Levinas, T&I, 172). Instead, the home attains the status of a chosen place because the presence of the Other graces it with the presence of the Infinite (164).

The ethical implications for education and mathematics education in particular are clear and challenging. They require us to ask questions regarding how we welcome Others into the homes into which we have been welcomed, and whether such dwellings are "instruments of ethical compassion…or…little more than miserable domiciles…?" (Gauthier, 2007, 165). These questions also provoke concerns when applied at other scales and are especially relevant to current concerns about trans-national migrations and the welcoming of foreigners and strangers.

Few students find a home in mathematics education as presently practiced. It is not often a chosen place. More often than not, the encounter with mathematics is not welcoming and many of our classrooms are not places where we invite students to dwell well *with* us through mathematics, but rather act as sites of colonization, conversion, occupation, and dehumanization. They are 'miserable domiciles' for teaching domestic docility. However, perhaps by learning *to* welcome, and by inviting our students to dwell well with us, each other, Others, and with the mathematical ideas necessary to participate and create responsibly in professional and civic mathematical discourses, we might open possibilities for classroom practices and lives that are "instruments of ethical compassion" (Gauthier, 2007, 165) and social transformation. But how is it possible to learn to welcome such unsettling difference joyfully in mathematics education?

The argument I am hoping to make, following Dewey, and others, is that through art we can come to an enlarged understanding of love, which reveals our awesome responsibilities for Others, and which opens possibilities for imagining and creating new, more just forms of social relationships at different levels. Dissanayake (1992) for example, argues for a central role of the arts in human evolution (both biological and social) and the aesthetic experience for her is filled with 'evocative resonance,' i.e. the sense that there is something deep and meaningful in the experience, which provides a 'satisfying fullness.' When such experiences are incorporated into social activities such as rituals and festivals she argues, they make tangible the possibility of social cohesion and transformation. Kerdeman (2005) also argues that aesthetic experiences are not only integrative of mind, body and emotion but offer therapeutic and ameliorative roles in the lives of individuals and perhaps societies. I also draw heavily on the work of Didier Maleuvre (2005) who explains his view of art as:

> …a form of sanctifying the human conversation, … [having] a destination beyond itself….The aim of art is not art… And the vehicle by which art travels into reality is not just skill, insight, knowledge or intelligence. It is love. (77)

Maleuvre makes a very convincing argument for viewing Art as a "teaching of Love" which resonates with me. For him, "Art is less concerned with delivering information about the world than teaching us about *how to stand in relation to it*, how to find our place in it, and live with it through art we do not seek to master the world so much as become its denizens…" (78-79). In this way he connects with Levinas' ideas of welcoming, hospitality and responsibility. This type of education is radically different from the other sort that typically occurs in schools. There is an intensely physical aspect to this love that calls us to remember that there is something special in *being with* other people. It is a teaching of Love. And of Love he says:

> Love, is a kind of falling… To fall is to experience the pull of physical reality… Now, love is a kind of falling because it calls us back to the tangible. Love is a connection with the particular and the unique, a face, a person, a body, a moment, a gesture… Now, inasmuch as love is the state of being in which the unique absolutely matters, it connects us to the physical. It is spirit falling into the flesh… Love is physical and sensuous, it needs to touch and embrace…Love is the joyful realization of being made of flesh. (82)

This recognition of the embodiedness and embededness of Love present in art points to an

intrinsic connectedness that unites us with other beings. Thus, he says, "Love is the disposition of being related, of being present to others. It is inaccurate to say that love connects what is separate. Love is the realization that nothing is separate" (85). These thoughts have deep resonances not only with D'Ambrosio's challenge regarding what it might mean to "do mathematics well" and how mathematics might be related to our human survival with dignity, but also with embodied perspectives in mathematics education (Lakoff & Nunez, 2000) which, by drawing attention to the important role of the body in mathematical cognition, re-establishes a sensuality of mathematics that "cold" cognitive approaches eschew, and calls us to attend seriously to questions of whose bodies are represented or not represented in mathematical discourse, how they are represented and how such presence or absence is felt and experienced by real bodies. These perspectives thus connect with the opening quote by Paul Feyerbend regarding universal mediators, like Art and Mathematics, which have the potential to mediate difference rather than annihilate it.

Teaching at times suffers greatly under the weight of an instrumental view of teachers, students and curriculum, and becomes merely a practical and increasingly economic arrangement; a means to ill-defined and often conflicting ends. Teaching though, understood from the perspective of Art as a teaching of love, 'opens us up' to more hopeful possibilities. For Maleuvre this radical opening up is exemplified by the process of portraiture. He says:

> The portrait is an achievement of human sympathy, of opening one's loving sensibility to the experience of another person. To open up in this manner requires time, patience, and dedication. It happens through labor and effort…The artist is penetrated by his subject until it becomes more central and immediate to his own self than his own stream of thought. In effect, the artist becomes a witness. He does not observe; rather, he dedicates his own existence to testify to another person's life. It is less technical achievement than a gift: a labor of moral generosity. (88-89)

This idea resonates with the Levinasian encounter with the Other, first experienced in the face-to-face and exemplified in Tricia, Rinnelle's and my own response to their faces and biographical portraits. Art, as a teaching *of* Love, reveals the very possibility of ethics. Teaching understood in this way, like the portrait artist, looks and feels radically different. There is the acknowledgement of Eros in the interpenetration and 'intervulnerability' of artist and subject, the caring dedication and effort put into exposing the relation between beings, the task that becomes not work alone but vocation that bears witness to love of self, one's work and the other. *What if* we tried to teach/perform mathematics in this way as a process of witnessing?

The encounter with Art also teaches us how to be attuned to the violence that permeates modern life and educational systems. Maleuvre (2005) also proposes a role for art in acting as an ethical indicator and as a vehicle for addressing moral issues. He says:

> …art is especially suited to decry the mutilation of human life… The violence that lacerates beings by the same token lacerates art…Violence maims, mangles, humiliates, and reduces persons to meat. It denies the victims language and self-expression. It punctures the human conversation that holds us above animality…[works of art] teach us to take care; to pause; to heed; to orient our attention away from egotist concerns; to attend to the other; to enter into a relation; to

> participate; to see as also we are seen. They are moral lessons, lessons in gentleness and sensitivity, in compassion and listening (91-92).

Art teaches us how to be for an Other who is not like our self without trying to make her like our self, how to hold off violently collapsing difference to the sterile singularity of sameness. Art teaches us how to be attuned to the violence in our lives and the lives of others when vulnerability becomes a source of humiliation or oppression. It gives us courage and hope and a springboard for action. Again the students' responses to each other's interviews and the interview subjects, their reports—literary and audio-visual portraits—awaken in them, a sensitivity to the ways in which mathematics education, when practiced as an art is able to speak to issues of gate-keeping, exclusion, reduced opportunities for self-determination, social stratification, and impaired conceptions of human dignity and the dignity of all work.

In my own experiences as a neophyte teacher I have been to the brink of depression and rage as a consequence of the violence and humiliation that one sometimes finds in school. But it has been Art: writing, drawing, photography, conversation and Love that have taught me how to find my way back, and which gives me the courage now to embrace the challenge of beginning to speak to those atrocities and to respond to more recent violations. Art has much to teach us, but not in the sense of facts about the world, but rather how to learn, how to feel, and how we *might* be differently in the world. Art offers us its self as a means to help us understand what it is that we do when we teach and what/who we *might* do it for. It offers us an opportunity to reconnect with the most fundamental aspect of modern schooling, of being with others in conversation, in Love, one that is romantic, erotic, communal and at times painfully aware of its own shortcomings.

In remembering, reading, and witnessing the contempt and violence with which we have treated (and continue to treat) our artists and their works one finds parallels and resonances with the contempt, violence and humiliation with which we treat each other and each other's work in education and elsewhere. The vulnerability of Art, like the naked face of the Other, offers us an opportunity to learn, an invitation to become an *hôte* and to extend hospitality from the dwellings, including mathematics, where we have been welcomed. The challenge is to begin to perform ourselves differently.

Third Iteration: Performing oneself differently

In the same course described above I introduced students to ethnomathematical ideas and practices. My choice of articles and activities were based primarily on aesthetic functions such as those proposed by Sinclair (2006) of evaluation, motivation and generation, but also oriented by the cultural diversity of Trinidad and Tobago where I have taught and lived, and a belief in the potential of learning about ethics through artistic creation and engagement with others. Students read about line drawings in different cultures and explored kolam patterns (Ascher, 2002) in class. They were then challenged to go to the beach and create their own

patterns for inclusion in their portfolio. Their reflections provide some insight into what might happen when one attempts to perform mathematical activities, and oneself, differently in non-traditional spaces.

> *When I was doing my tracings in the sand, many individuals stopped and looked on but no one asked any questions. At first I was a bit embarrassed and I was not getting the pieces right, but I persevered and got a few.* (Sabrina)

> *I can recall going on the beach one Sunday afternoon to do some line drawings and everyone watching me like if I am about to perform a ritual in a public place. This created a kind of anger within me because I don't like to be embarrassed. As a result I moved to a private beach out of the sight of individuals to get my drawings done…The line drawings were very difficult at times and required a lot of thought before attempting to complete them in the sand, especially when trying not to raise my hand out of the sand. I enjoyed this aspect of the exercise because it challenged me and gave me the opportunity to work exceedingly hard at times to figure out how to complete the drawing…*(Deon)

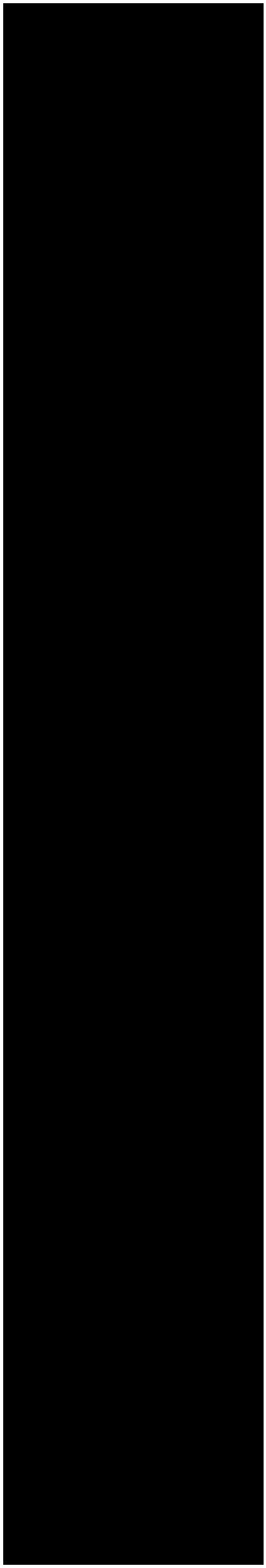


Figure 1 a,b,c,d: Student kolams and Malekula nitus (reproduced with students' permission)

> *Having to make my own line drawings in sand turned out to be a more interesting activity than I had anticipated. I discovered that the drawings I appreciated most on paper were not the ones I liked when they were drawn in sand. I had never thought that the medium used could affect the aesthetics so much.* (Rhoda)

In performing oneself differently, one opens one's self up to scrutiny, isolation and embarrassment. In asking students to step outside the safety of the classroom space for the performance of an aesthetically motivated mathematical activity, they were placed in a position of being seen as strangers in their own land. Through it they were given an opportunity to become aware of their own vulnerabilities before others. What, though, did they learn from this risky undertaking? Deon found satisfaction in an activity that was intrinsically rewarding, aesthetically motivating, yet sufficiently challenging, while Rhoda learnt how the medium of representation, sand versus paper, can affect the aesthetic qualities of the product, an insight that also has relevance for how we choose to present mathematics in classrooms. In all cases, the students came to care for their drawings, not as mathematical objects, but as aesthetic creations linked to a sense of their own self-worth, frustrations and accomplishment. Their performances also raised questions about performing 'unnatural' rituals, such as line drawings, or even formal mathematics, in public spaces with their rigid social expectations and norms. In performing this unnatural ritual, mathematics, in a public space like a beach, students engaged not only in a mathematical and aesthetic activity but a political and deeply personal one as well.

Attention to the relationship between the aesthetic and the political is discussed by Linker

(2003), who provides a way into discussions about the practice or performance of politics in classrooms, schools and wider society. He writes:

> …all politics has an aesthetic nature…culture is a self-organizing, non-equilibrium system in which there is *only* the aesthetic and the political. Understood in this way, politics and aesthetics are not discrete areas of practice. The political, in this sense, represents the entire field of human relations and production. The aesthetic is the *performativity* of those relations…Though they may be examined in isolation, they are irrevocably bound; the aesthetic shapes the political, is the source of its power, and the political provides context for the aesthetic. (italics added, 16)

By applying this performative model to education, he argues that the fundamental necessary condition for a revised pedagogy is a revised conception of knowledge as a means to pursue purposes that are not prescribed outcomes, but rather an entering into ongoing processes that are always partial and incomplete. Such an education, he suggests, is fundamental to preparing citizens "for responsible participation in the *societas*, and education in the arts demonstrates the opening of liminal spaces required to facilitate such participation" (105). In stepping into this liminal public space, a beach (between sea and land), students' aesthetic activity took on a political dimension. In performing the activity, they were required to be courageous and face fears and anxieties imposed by social conditioning as they mediated the psychological liminality related to expectations around performances in different spaces. In performing themselves differently, artistically and politically, they discovered something about their selves.

Of interest is the way in which changes in mathematical thought are related to changes in aesthetic considerations, and perhaps changes in patterns of human behavior (ethics). Whitehead (1941/1951) alludes to this relation between mathematics and patterns of social organization and behavior by casting art as the study of pattern. He argues:

> …the cohesion of social systems depends on the maintenance of patterns of behavior; and advances in civilization depend on the fortunate modification of such behavior patterns. Thus the infusion of pattern into natural occurrences, and the stability of such patterns, and the modification of such patterns, is the necessary condition for the realization of the Good….Mathematics is the most powerful technique for the understanding of pattern and for the analysis of the relationships of patterns. (677-678)

Thus for Whitehead, the approach to the good via mathematics depends on a sensitivity to pattern, the cultivation of which occurs in both mathematics and aesthetics. The history of (Western) aesthetic thought however is dominated by values derived from Euclidean geometry, structures that still linger, underlie and influence our conceptions of school, teaching, curriculum and social organization (Davis & Sumara, 2005). Plotinsky (1998) however argues that non-Euclidean geometries, such as those present in many non-European cultures, as well as research into the foundations of mathematics, Godel's incompleteness theorems, as well as more recent work in topology, algebra, chaos and complexity theories, are challenging key aspects of classical aesthetics, as well as the epistemology and ontology of mathematical knowledge. Relying on Nietzche and Derrida he states:

> …we may be forever hampered by the absence of any fundamental absolute center…The resulting aesthetics and epistemology may be seen as the aesthetics and epistemology of networks that are both radically decentered and radically oblique …the radical aesthetics of mathematics and science that may emerge…may no longer be fully mathematical…[rather] the new aesthetics is the aesthetics of multiple interconnections…The conjunction of the known and the unknown, the knowable and the unknowable, may well be… the most sublime feature of mathematics and science. (197-198)

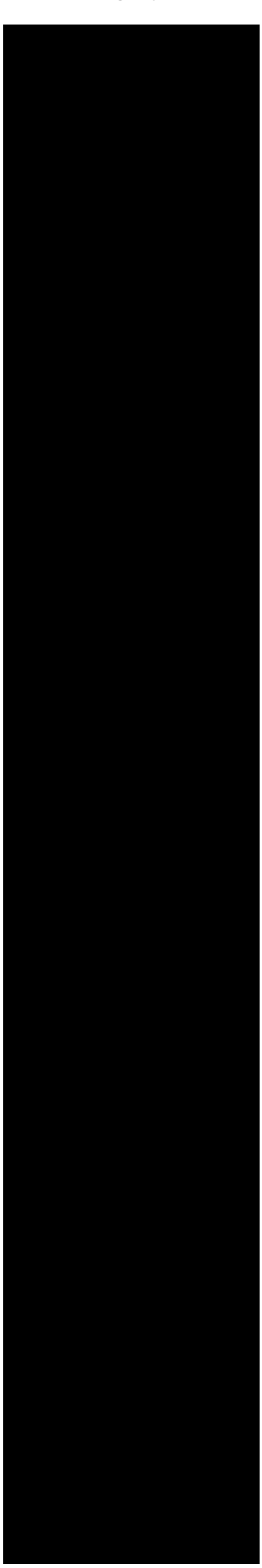
This analysis of the co-implicated, co-specifying philosophies of aesthetics and mathematics, suggests the possibility for conceiving of mathematical (educative) projects that are radically decentered and radically oblique to the *traditional* aims of both mathematicians and mathematics educators. The de-centeredness conjunction of the known and the unknown, in the Levinasian frame, suggests not only the need to perform mathematics differently, but to do so with a Desire for the Other.

In my practice as a mathemaesthethician I am aware that my performances, courses, assignments and invited talks, the way I welcome students and visitors, what and how I write in public fora are always political and aesthetic, and are attempts to open spaces within the academy, where difference might dwell well. Nobel Laureate in literature V. S. Naipaul, who exists in a somewhat strained relationship with this homeland, has criticized Trinidad in particular by saying that 'nothing' has been produced here. I agree with him in the sense that if 'thing' is akin to a well-defined object (physical or intellectual) that is reproducible, commodifiable and easily exportable to other contexts, then no '*mere thing*' has been produced here, rather what has and is continually produced is not as simple as a thing. No, what is produced here is *performance*. And if we wish to say that our culture and cultural products, including our mathematics, arts and contested democracy, are *per-formative* (*for* formation), then the criteria for evaluating such performances are vastly different from the criteria for things and objects. Thus, I have come to believe, taking culture as an autopoietic system, that a carrion culture of domination, disempowerment, disenfranchisement and death in mathematics education, and education more generally, can only be dynamically transformed by performing itself *differently*, and in so doing, transform itself, its context, and its knowledge about the relations between itself and its context, and through this performance come to know *itself better* and know *its better selves*.

The end of education, taken as a living artistic practice, is Love. And indeed I would like to offer that even this Love has to be attuned to an even greater end. Perhaps by performing mathematics education differently we (me) and our (my) students might come to know ourselves better and indeed know and perform our better selves? This concern with the performative dimension thus provokes for the educator the question of *a* standard for the performance. I want to propose that such *a* standard[13] is to be found in Levinas' conception of the Holy.

Fourth Iteration: Towards Holiness as an end for education

This is the fourth iteration of the L-system introduced in the first section. The image is 'evocatively resonant' for me in that it is at once hauntingly familiar yet somewhat



ambiguous. The image summarizes the identity I hope to perform as a mathemaesthethician. It re-presents my attempts at exploring non-standard, ab-normal[14] mathematical/artistic performances and experiences with Others. Before proceeding to finish the reading of this paper, spend a few moments reflecting on what it means for you. For me, in the outstretched arms and wire-like frame I see Trinidad's indigenous art form, the *mas*, incarnated once per year in the Carnival, a two-day street theatre, rooted in practices that are slowly being extinguished by the forces of globalization, consumer capitalism and education. I see a human being performing him/herself. The head bent forward, an indication of the weight of responsibility, as well as the joy of work that is also play, and the satisfying fatigue that one feels when one is rewarded by one's work.

In the image, generated mathematically, there is celebration as well as suffering. The image is also an invitation to a difficult conversation about the ends of education in general, and mathematics education in particular. Following Amartya Sen's (1999) provocative and important work in rethinking economics, *Development as Freedom*, in which individual human freedoms and their expansion form a necessary prerequisite for sustainable economic development, and drawing on Emmanuel Levinas and his commentators, I have begun to ask *What if* we take *Holiness* as an end for (mathematics) Education? What might it mean to *perform* Holiness as a mathematics educator?

For Levinas there is a distinction between the sacred (*le sacré*) and the idea of Holiness (*la sainteté*). The sacred refers to religious experiences that encourage a loss of one's sense of self and capacity for rational engagement, a phenomenon that perhaps also occurs to some degree in mathematics education. It represents the desire to merge with, to become one with, or take on the characteristics of, what is believed to be the divine realm or the attributes associated with the supernatural, such as power or omniscience. Holiness for Levinas, however, means ethical separation, as before the Holy one comes into an experience of 'presence,' an aesthetic experience like the one has with great Art, where upon hesitation and lingering, one is welcomed and becomes increasingly aware (learns) of oneself as separate, a unique and distinct being with unique responsibilities. The recognition of this distance, the absolute and irreducible difference of the other to whom we are responsible, invites us to welcome and venerate the Other's difference without seeking a reduction to the singularity of sameness. It is this that marks the encounter with difference as Holy. To be morally whole, for Levinas then, is "to accept the authority…of the gaze that questions our self-absorption and that makes us aware of our capacity to be cruel. Only this gaze can cut through the hardened shell of the ego" (Caruana, 2006, 578). Indeed as Caruana goes on to note, for Levinas the true sign of integrity "…is the ability to affirm one's bad conscience, or…to refuse to make compromises with the moral indifference of existence" and thus, "the true divide [or] fundamental split for Levinas is not between believer and non-believer, but rather between those who "are shaken by their own potential for brutality and those who are oblivious to it" (Finkielkraut, 1997, in Caruana, 2006, 579).

These words in particular have deep resonance with me as a mathematics educator and researcher. I am continually having to confront my own immense 'capacity for brutality' that comes from being part of systems of power and privilege, which at times appear to be 'faceless' or attempt erasures and silencing of identities, which allow a slippage, dilution, or evasion of personal responsibility. As a Trinidadian, I am compelled to reflect on what is a transnational concern, perhaps even a human universal, namely, the seeming inability/incapacity of many citizens, including children, to be shaken by their escalating capacity for brutality in every sphere of life, both public and private, and while it is becoming more and more difficult to avoid the consequences of our past brutalities, I fear that we are close to a tipping point in which we may *choose not to* acknowledge the existence far less the authority "…of the gaze that questions [our] self-absorption and that makes [us] aware of our capacity to be cruel" (Caruana, 2006, 578).

I am only just beginning to articulate responses to questions such as, "What *might* our roles as teachers be *if* we accept Holiness as a worthy end for education?**"** How might the practice of mathematics education be more welcoming to difference and help us to recognize our capacity for brutality? In reading Levinas alongside Caribbean philosophers of art I see resonances as in the example below, with my annotations in parentheses: [].

> **Once ready, yes, one has to be ready,** [To see, hear, listen, love, do, risk—preparation, present, vigilance] **Art will summon you** [The Summoning/Call/Turn towards/Invitation/Approach] **like the great voice of love and beauty, like the voice of some lost longing that has remained hauntingly familiar to memory alone** [A difference that speaks of something that is the same—the difference that returns that is not the same but difference]. **An inner memory that enraptures the spirit** [Aesthetic & Erotic, in an embodied cognitive system—a revelation that is not a knowledge] **and shapes expression** [performance] **not in fraud by defining truth, by postponing confrontation with the nature of the subject** [foregrounding presence and difference, deferring, not abandoning ontology and epistemology], **but by revealing itself** [but not its nature] **clearly as a flame of a first or last moment—a presence** [the face]—**which captures the soul** [calls us to relation—ethics/violence] **and gives it wings of imagination** [Power & Responsibility] **which seeks only to "burn all things until they become infinite and holy"** [The infinity of Desire which does not imply consumption or synthesis, as in the burning bush, but the transformation of self and home and relation of self to Other and home].(Leroy Clarke, 1982, in Clarke, 2003)

Meditative Meanderings

> Ethics is forceful not because it opposes power with more power,… with a bigger army, more guns…but rather because it opposes power with what appears to be weakness and vulnerability but is responsibility and sincerity (Levinas, 1985, 13).
>
> We have to see creation as tracing a path between impossibilities…Creation takes place in choked passages…A creator who isn't grabbed around by the throat by a set of impossibilities is no creator. (Deleuze, 1995, 133)
>
> Cruel…curling fingers, squeezing…bruising…impairing speech.
> Follow, hollow eyes direction…compliantly, silently, into darkness.
> Thunderstorm…a violent reign of blows, from children's empty hands,
> Enough!

There is a transformative potential in (some) traumatic events and I am trying to feed the incident described in my Witness Statement at the beginning of this paper, and even more recent witnessing to my own complicity in violence[15], positively into my emerging practice. Questions arise. How might this incident be related to my purposes for being in that particular place at that time? How might this be related to the professional mathematics education practices I was engaged in during the day as the Chair of a panel revising/updating a regional curriculum (syllabus) document? In what ways might 'mathematics' have contributed to these young men's desire for illicit enrichment and personal humiliation? Reading the incident report again, I wonder, surely some, perhaps many, of our students, feel that they are being held and led by the throat, menacingly 'invited' to silently follow to a dark place, where they may not wish to go? They too are creators.

The teaching/learning autobiographies I read from my final year B.Ed students, as well as my own, all speak to a long history and a more than passing acquaintance with violence in mathematics at all levels of their educational experience. Ingrid's biographical statement, for example, relating her earliest memories of mathematics: "My first introduction to arithmetic and the first resources I interacted with were a copybook, a pencil and a ruler. The ruler was not for measuring," is stark and clear in its understated brutality. The others recount similar brutalities, even at the tertiary level. It is amazing that they have survived, bruised, battered but hopeful, the result of a chance encounter with a wonderful and inspiring teacher, an artist, someone who reached out and transformed their relationships with mathematics. I hope I can do the same in mathematics education. Others though do not make it. Why are their narratives filled with stories of contempt, attempts to dominate and humiliate? Why do we allow teachers, including ourselves to wield such mathematical power without making them aware of their/our overwhelming capacities for brutality?

Members of our committee worked late and finished our assignment on time. This part of the curriculum renewal process completed in the four days assigned to it. Rationale and aims being the last sections to be worked on, the word propaganda delicately excised from the document and replaced by critical interpretation. Good work team. We don't question the economic justifications that led to us being there, to take on a task that rightly requires more time and perhaps more heads and hands. We never question it. We just get on with doing the job, our wuk. Mathematics teachers have been selected for precision, persistence and passivity. We are Empire's somnambulant heirs. Recommendations for changes based on responses from those in the field; 20 odd teachers respond to questionnaires. A 'representative' sample and responsible advocate for tens of thousands of students? *Can we get rid of the multiple-choice paper? No, that's not possible.* We bind ourselves to little boxes. The structure of the examination remains relatively intact. There will be little change in teachers' practices in the classroom. I predict. We'll be doing the same thing in a couple year's time, same problems, same frustrations, same solutions proposed. Much like the examination paper itself! I wonder though, on the final day, whether what we did would change anything, whether it would make any difference to those boys, my assailants, my teachers, and so many others like them? I look at the document, printer ink still drying, and think not.

Coming home, safely, my wife reads the story of my learning on my body, traces the welts and scratches on my neck, imagines teenage fingers squeezing; sees the black and blue bruise above my lip; kisses the bump on my head that is slowly going down but still sore. My injuries are, thankfully, not serious. They are nothing in comparison to the scars and wounds carried by some of our teachers and students. Our bodies are palimpsests, written on, over and over again, by so many scribes, poets, lovers, armies; we always bear their traces, they ought never to be written off, written out or forgotten in history's exiles. That is a path that leads to genocide. We must read and write, witness and testify, honor and hallow these markers.

What can we read from the bodies of the students in our mathematics classes and mathematics education courses? What stories of violent encounters are already being written over and over again? Are we the scribes? Dare we write differently and teach them to write their/our bodies responsibly? Who will dress and soothe their wounds when they come broken and hurt, humiliated and afraid? Anushka, a teacher-student, stands in front of me, trembling, with eyes and heart like levees overflowing, a state no one ever wants to be seen in. She has been robbed at gunpoint by unmasked men in broad daylight. I offer her a gentle touch and a re-assuring squeeze. I feel like a miser. Lucia and Marketa, strangers, offer me smiles and conversation. I am overwhelmed by such generosity. Savitri deviates from her assigned task, describing, testifying instead, to perceived age, caste, ability and gender biases as a young Indian female mathematics teacher. I am outraged, *with* her. Listening, we honor her meander.

Mathematics education is iatrogenic but perhaps as Ed Dolittle (2007) suggests it might also be medicinal. But it cannot do this alone. It needs Art and it needs Ethics. I am coming to another tentative conclusion that perhaps Mathematics education needs an ethical psychoanalytic hermeneutics—a practice of an archaeology of interpretation for healing and responsible action—as it works through and towards learning/living to welcome Love and Holiness.

I have come to realize that as long as I *choose* to teach 'mathematics' or the even less well defined 'mathematics education,' I have already lost the war no matter how many battles are won. The challenge however is to win the peace. How do I do this? Eighteen months later I finally have an answer for Bill, who asked at my thesis defence, *Where's the math?* The math will always be there Bill, our students' hearts, minds and bodies may not be for one reason or another. This *is* the reality in the violent societies we live in. But it doesn't always have to be so. Instead, I elect to *'teach'* my students humanity and holiness. To remind them, that they teach *for* humanity, and challenge them to teach humanly, how to be Holy. Perhaps I can do this *through* mathematics and art and ethics. "Perhaps", as Solzenhitsyn (1972) hopes:

> the old trinity of Truth, Goodness and Beauty is not simply the dressed up worn-out formula we thought it in our presumptuous, materialistic youth? If the crowns of these three trees meet… and if the too obvious, too straight sprouts of Truth and Goodness have been knocked down, cut off, not let grow, perhaps the whimsical, unpredictable, unexpected branches of Beauty will work their way through…and thus complete the work of all three?...Then what Dostoevsky wrote –"Beauty will save the world"—is not a slip of the tongue but a prophecy… (7-8)

What comes after the thunderstorm?

Acknowledgements

I would like to express gratitude to my wife Shalini for her assistance and patience during the preparation of the paper; Bill Higginson, for directing my early inquiries into mathematics, aesthetics and ethics; Dalene Swanson and an anonymous reviewer for their thoughtful reading, provocative comments and encouraging critique; and to the students named herein for their generosity and permission to share parts of their stories.

[1] The title is, unapologetically, a play on Hardy's (1940) biography, "A Mathematician's Apology" and seeks to orient the discussion away from an *apologia* to an *ethics*.

[2] I have chosen not to use the word 'victim,' as I am trying to see myself as *'learning'* from the young men and this challenging encounter with difference.

[3] I am using performance in the sense of Babha (1994), as a strategy of representation and empowerment that seeks ethical and political engagement through negotiation, narration and re-articulation of difference from minority perspectives that "transform [one's] sense of what it means to live, to be, in other times, both human and historical" (367).

[4] I have coined these terms as metaphors for stasis and death (Khan, 2007). Carrion culture is a critique of culture that is in the process of consuming itself and produces only more death upon which to feed, and whose continued existence requires that those involved in performing the culture continue to 'carry on' with business/consumption as usual. Carrion structures and societies are the complex nested frameworks of bureaucracies and hegemonies, which through their interactions maintain carrion cultures. They are strictly concerned with regulation of difference.

[5] In Trinidadian dialect "to put down a wuk" can mean to engage in casual intercourse, or in transient government sponsored 'work activity' or to commit a crime. It is not used derogatorily; rather I use it in the sense of a *strict* utilitarian/functional or pragmatic relationship.

[6] Mathemaesthethics is a hybridized conjunction of *mathema*, *aesthesis* and *ethics*, somewhat akin to the ancient Greek triumvirate of 'truth,' 'beauty' and the 'good,' (Fokas, 2004) and drawing inspiration from Ubiratan D'Ambrosio's (and others) *ethno mathema tics* programme, though seeking a movement away from the technological aspects to the ethical aspects of the practice.

[7] I conceive of a democratic community as one which continuously works to provide equality of access to diverse opportunities for all through continuously interrogating the ways and means by which individuals and groups do not currently share or benefit from power equally (see for e.g. Macintyre, 1999).

[8] By a synaesthetic project I mean one that is integrative of, yet more than the sum of, different sensory, curriculum or pedagogical experiences.

[9] Fractal amplification originates from a complexivist attitude in which the recursive generation of self-similar systems across scales and contexts and the foregrounding of contingency and complicity suggest that if the trajectory of such multi-agent systems are to be changed, then the network of actions and interactions and selection patterns of agents, i.e. their performances, must change, i.e., they must perform themselves differently.

[10] The images used as section headers are iterations of a simple L-system. They are illustrative of ideas of iteration and elaboration, and how given identical rules, small differences, such as in the initial angles, can produce very different and aesthetically and emotionally satisfying outcomes. The left-handed images are produced using right angles, which generates/reproduces successively larger grids. The right-handed images use an angle slightly more than 90 degrees and generate a very different system. They were a part of the B.Ed. course described in the paper.

[11] This is not to suggest an intrinsic value of mathematics but to point to problematic relationships between individual identities, self and social worth, and mathematics' complicity in these constructions.

[12] Todd (2006) explains that she is "using theory rather loosely to indicate a constellation of ideas that reflect a certain consistency with respect to how a subject is taught" rather than "in the technical sense of a well-developed explanatory system." (13)

[13] The word 'standard' is a polysemous signifier. In my usage here, I mean to evoke the sense of a symbol or idea

that, supported by human/embodied anchors, serves to announce a place for assembly and identity.

[14] That is to say, moving away from the deterministic reproductive Euclidean prisons of right-angled, normal, standardized approaches to disruptive, evocative and creative potentials afforded by deviating even slightly from the 'right' angles.

[15] Even as I prepare the paper for submission on this the deadline day, I am witness to the violence meted out by a group of teenage boys to a young female teacher by their unwelcoming insolence, the violence I mete out in an angry response, and that of the Principal in forcing a public class apology.

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About the Author

Steven Khan is a Caribbean scholar from Trinidad and Tobago. He taught Mathematics and Biology at the secondary level in Trinidad for 5 years, eventually resigning in order to respond to an offer to explore performing as a Lecturer in Mathematics Education at the University of the West Indies, St. Augustine. He is currently pursuing a doctorate in Education at the University of British Columbia in the Department of Curriculum and Pedagogy where his areas of interest include secondary mathematics education, teacher knowledge for teaching and teacher preparation, ethnomathematics, ethics, qualitative research methods, complexity thinking and education, pedagogy of children's popular culture, post-colonial theory, social justice and most recently disability studies. He enjoys photography and writing poetry and can be contacted at stkhan@fhe.uwi.tt or stkhan@interchange.ubc.

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